



Smart Mobility Hubs (SMH) System Design Document

for the Smart Columbus
Demonstration Program

FINAL REPORT | May 29, 2019



Produced by City of Columbus

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Table of Contents

Chapter 1. Introduction.....	1
1.1. Scope	1
1.2. Context.....	1
1.2.1. Design Traceability to User Needs	2
1.2.2. Requirements Traceability	2
1.2.3. System Interface Traceability	2
1.3. Related Documents	2
1.4. References	3
Chapter 2. System Stakeholders.....	5
2.1. Project Stakeholders	5
2.2. Roles	6
2.3. Responsibilities.....	7
2.3.1. Deputy Program Manager	7
2.3.2. Project Manager.....	8
2.3.3. Design Engineer	8
2.3.4. Technical Lead	9
2.4. Project Agreements	9
Chapter 3. Design Concerns	11
3.1. Smart Mobility Hub Design Concerns	11
Chapter 4. System Decomposition	12
4.1. Interactive Kiosks	13
4.1.1. Traveler Information Subsystem	15
4.1.2. Emergency Call Button Subsystem.....	26
4.1.3. Wireless Internet Subsystem.....	29
4.1.4. Device Charging Subsystem.....	31
4.2. Mobility Infrastructure	33
4.2.1. Ride-Share	33
4.2.2. Car-Share	35
4.2.3. Dockless Parking	36
4.2.4. Park and Ride	37
4.2.5. Bike-Share	38
4.2.6. Bike Racks.....	40
4.2.7. Automated Vehicle Shuttles.....	41
4.2.8. Electric Vehicle Charging Station	41

Chapter 5. Mobility Hubs.....	43
5.1. Columbus State Community College	44
5.1.1. Miscellaneous Information	44
5.1.2. Columbus State Community College Location and Geometric Layout	44
5.2. Linden Transit Center	46
5.2.1. Miscellaneous Information	46
5.2.2. Location and Geometric Layout	46
5.3. St. Stephen’s Community House	48
5.3.1. Miscellaneous Information	48
5.3.2. Location and Geometric Layout	48
5.4. Metro Library – Linden Branch	51
5.4.1. Miscellaneous Information	51
5.4.2. Location and Geometric Layout	51
5.5. Northern Lights Park and Ride	53
5.5.1. Miscellaneous Information	53
5.5.2. Location and Geometric Layout	53
5.6. Easton Transit Center	55
5.6.1. Location and Geometric Layout	55
Chapter 6. Design Rationale.....	57
6.1. Bike-share Docking Station.....	57
6.2. USB Charging	57
6.3. Car-Share, Park and Ride	57
6.4. Emergency Call Button	57
6.5. Signage.....	57
6.6. Accessibility.....	57
6.7. Interactive Kiosk.....	58
6.8. Electric Vehicle Charging	58
Chapter 7. Summary of Conclusions	59
7.1. Project Objectives Review	59
7.1.1. Mobility Objective.....	59
7.1.2. Customer Satisfaction Objective.....	59
7.2. Future Project Enhancements	60
Appendix A. Traceability Matrix.....	61
Appendix B. Acronyms and Definitions	107
Appendix C. Glossary	111

List of Tables

Table 1: References	3
Table 2: Project Stakeholder Contact Information	6
Table 3: System Design Roles and Contact Information	7
Table 4: SMH Anticipated Agreements.....	9
Table 5: Smart Mobility Hub System Amenities	12
Table 6: Interactive Kiosk System Components.....	18
Table 7: Interactive Kiosk Data and Message Type	20
Table 8: Interactive Kiosk Hardware Components	21
Table 9: Emergency Call Button System Components	27
Table 10: Emergency Call Button Data and Message Type	28
Table 11: Emergency Call Button Hardware Components.....	29
Table 12: Wi-Fi System Components.....	30
Table 13: Wi-Fi Data and Message Type	31
Table 14: Wi-Fi Hardware Components	31
Table 15: USB Hardware Components	33
Table 16: SMH Mobility Objective	59
Table 17: SMH Customer Satisfaction Objective	59
Table 18: Traceability Matrix.....	61
Table 19: Acronyms List	107
Table 20: Glossary	111

List of Figures

Figure 1: IK Physical Model	14
Figure 2: IK Custom Branding Options	15
Figure 3: IK Traveler Information System Design	16
Figure 4: Interactive Kiosk System Applications	17
Figure 5: Interactive Kiosk Foundation Design	23
Figure 6: ADA Pedestrian Accessibility (Ground Space Position to Kiosk).....	24
Figure 7: Standard USB Plug Design (Dual Architecture for Low and Super Speed)	32
Figure 8: Generic Ride-Share System Design.....	34
Figure 9: Project Scope Area Along Cleveland Corridor.....	43
Figure 10: Planned Design for the Columbus State Community College Mobility Hub	45
Figure 11: Planned Design for the Linden Transit Center Mobility Hub	47
Figure 12: Planned Design for St. Stephen's Community House Mobility Hub	50
Figure 13: Planned Design for the Metro Library – Linden Branch Mobility Hub.....	52
Figure 14: Planned Design for the Northern Lights Park and Ride Mobility Hub.....	54
Figure 15: Planned Design for the Easton Transit Center Mobility Hub	55

Chapter 1. Introduction

1.1. SCOPE

The Smart Columbus Smart Mobility Hubs (SMH) project is one of eight projects in the Smart Columbus program and is considered the future of consolidated transportation centers. The project is scoped to deploy a number of transportation amenities at six different facilities. These amenities work together to deliver mobility as a service (MaaS) providing travelers with new and consolidated transportation options to move about the region using various modes.

SMH will deploy interactive kiosks (IK), which will provide access to Comprehensive Trip Planning (CTP) services including the Multimodal Trip Planning Application (MTPA) with a centralized Common Payment System (CPS), real-time transportation data for various modes, call button for emergency services, Wi-Fi internet access, USB charging, notifications/advisories, and local event information. The facilities are also designed to accommodate multiple modes of transportation from a single location including bike-share, car-share, and scooter-share, while facilitating pick-up/drop-off points for mobility providers. These services are particularly useful in the completion of first-mile/last-mile (FMLM) and multimodal trip options.

The purpose of this System Design Document (SDD) is to describe the system design in detail to stakeholders interested in design implementation details. The intended audience for this SDD includes the City of Columbus project team, United States Department of Transportation (USDOT), vendor development teams, product owners, and technical and managerial stakeholders with an interest in the SMH design specifications. The document may also be used as a resource by future transportation mobility projects and state DOTs designing and deploying smart mobility hub amenities.

The SDD framework has been adopted from IEEE Std 1016TM-2009 (Revision of IEEE Std 1016-1998) *IEEE Standard for Information Technology — Systems Design — Software Design Descriptions* and includes descriptions for hardware and software.

1.2. CONTEXT

This document is composed of four primary parts. The first part introduces the concepts for the SMH system as a whole by discussing project stakeholders and SMH design concerns. The next segment presents a high-level summary of each amenity along with the capability it offers travelers within the scope of the project. Thereafter, detailed design elements are presented per amenity from the viewpoint of the technical product (e.g., IT, software engineering, communications, etc.) in terms of system software and hardware components. For each SMH amenity, a technical product-specific design view will be presented, as applicable (note, design elements in **Chapter 4** apply to all sites independent of installation location):

- Amenity name and description
- Software system
 - Services
 - System components
 - Data and message flows
 - Network and communications
 - Hardware components
 - Interface traceability

- Requirements traceability
- Hardware
 - Design structure
 - Physical loads and forces
 - Materials

Finally, the fourth segment presents a description of each SMH facility (i.e., mobility hub) from the viewpoint of the business owner as it relates to the construction planned for that location.

For each SMH facility outlined in **Chapter 5** the location-specific amenities along with the unique engineering and construction views for that location will be presented in the following format, as applicable:

- SMH facility name and description
- Location, planned amenities, and geometric layout
- Structure design
- Miscellaneous (utilities, lighting, signage, drainage)

1.2.1. Design Traceability to User Needs

This SDD also provides traceability back to user needs, requirements, and SMH system interfaces. User needs captured in the project Concept of Operations (ConOps) are expressed in terms of capability (lacking) or needing the ability to (action verb – perform, capture, do, review, etc.) some “articulated need”. As such, user needs are tied to, and addressed by, the Service(s) each amenity provides (Service is a labeled header herein) – as the outcome of each Service delivers a (new) system capability.

1.2.2. Requirements Traceability

System requirements for the SMH project were established through the SyRS and for the most part, they are traced to design elements in the “System Components” section(s), respectively. These sections define how the component is designed (physically and logically) and the requirement identifier traced can be primarily found within the system component tables, in the “Reference” column; however, some requirement identifiers can also be found in other areas of the document as appropriate, when the design element that is being defined is a result of a requirement.

1.2.3. System Interface Traceability

A number of amenities that are part of the current SMH project do not require data, network and communications, or perhaps are not instrumented for data collection at the time of SMH design. However, for those amenities that do require data flows (and thus network communications) as part of the service design, the system interface(s) has been traced. Note that specific data element details per interface is appropriately captured by the SMH Interface Control Document (ICD) and therefore, not detailed quite as in-depth within this SDD. System interface traceability has been captured in the Data and Message Flow section of each subsystem.

1.3. RELATED DOCUMENTS

The SMH design is constructed to meet the user needs and features identified in the SMH ConOps and meet the requirements established in the System Requirements (SyRS). It is also supported by the Interface Control Document (ICD) which provides a detailed description of the internal and external interfaces for the

SMH project and the data, information, and messages that are communicated across those interfaces. The design is built upon the architecture described in the Smart Columbus System Architecture and Standards Plan (SASP) and provides traceability of requirements from user needs through design.

- Concept of Operations for Smart Mobility Hubs for the Smart Columbus Demonstration Program
- System Requirements for Smart Mobility Hubs for the Smart Columbus Demonstration Program
- Smart Mobility Hubs Interface Control Document for the Smart Columbus Demonstration Program
- System Architecture and Standards Plan for the Smart Columbus Demonstration Program

These documents are available from the digital document library on the Smart Columbus project site at: <https://smart.columbus.gov/projects/>. A copy of these documents can also be obtained by sending a request to: **City of Columbus**, Attn: Department of Public Service, 111 N. Front St., Columbus, OH 43215.

1.4. REFERENCES

Table 1 contains documents, literature, and working group sessions used to gather input for this document.

Table 1: References

Doc. No.	Title	Rev.	Pub. Date
FHWA-JPO-17-518	Smart Columbus Systems Engineering Management Plan (SEMP) for Smart Columbus Demonstration Program https://rosap.nrl.bts.gov/view/dot/34764	–	Jan. 16, 2018
1016-2009	IEEE Standard for Information Technology – Systems Design – Software Design Descriptions	–	2009
INCOSE-TP-2003-002-03.2.2	INCOSE Systems Engineering Handbook	3.2.2	2011
–	Systems Engineering Guidebook for Intelligent Transportation Systems	3.0	2009
–	Smart Columbus Operating System https://www.smartcolumbusos.com	N/A	N/A
–	Concept of Operations for Smart Mobility Hubs for the Smart Columbus Demonstration Program		2018
–	System Requirements for Smart Mobility Hubs for the Smart Columbus Demonstration Program	N/A	2018
–	Smart Mobility Hubs Interface Control Document for the Smart Columbus Demonstration Program	N/A	2019
–	System Architecture and Standards Plan for the Smart Columbus Demonstration Program	N/A	–
1851-A	City of Columbus, Ohio; Department of Public Service; Division of Design and Construction; Smart Mobility Hubs Standard Construction Drawings	Stage 3 Submittal	–

Source: City of Columbus

Chapter 2. System Stakeholders

System design can cross many different groups within an organization to ensure requirements are gathered and met for all stakeholders. As such, the roles and responsibilities section is included to provide clarity to the team on who performs various roles. This section also includes a list of points of contact for the team and stakeholders to use should issues or concerns arise.

2.1. PROJECT STAKEHOLDERS

1. City of Columbus – Owner of the SMH project through the Smart Columbus Program.
2. Central Ohio Transit Authority (COTA) – COTA is the Columbus area transit leader and a stakeholder to the SMH project as the regional transit authority and as the site owner for three SMH installations.
3. Columbus State Community College (CSCC) – The CSCC campus surrounds downtown Columbus' southernmost SMH location. While the SMH will be located completely in the right-of-way (ROW), coordination is essential as many development projects are being completed in the area.
4. Columbus Metropolitan Library (CML) – The CML exists in 23 locations throughout Franklin County. The Linden Library location on Cleveland Avenue is the site for one SMH location.
5. St. Stephen's Community House – St. Stephen's has been a community gathering place for 100 years and offers services including childcare, youth, family, and senior services. St. Stephens is an SMH location that will offer all SMH services on its property, including the kiosk inside the building.
6. City of Columbus 911 Call Center and Police Department – The City's 911 Call Center will be the public safety answering point that is responsible for responding to the activation of five of the kiosk's emergency buttons. The City's 911 Call Center will dispatch the call to the Columbus Police Department.
7. Franklin County Sheriff's Office – The county's Sheriff's Office could be one of three responding agencies at the Northern Lights SMH location. The location of the kiosk is within the City limits, but the Clinton Township line is within eyesight of the kiosk and it is conceivable that someone could push the emergency button for an incident within the Township. Therefore, the Franklin County Sheriff's Office dispatch the Clinton Township Police Department for emergency call button activations at Northern Lights SMH.
8. Clinton Township Police Department – The Northern Lights location is located both in the City of Columbus and Clinton Township and therefore, the Clinton Township Police Department will be the first responding agency to the County's 911 Call Center dispatch for this location.
9. Mobility Providers – Mobility providers will have their services present at the SMH locations. Each location will have a select number of services based on the space allowable and through coordination with each of the property stakeholders. Mobility providers will include companies with the following services: bus transit service, dockless bikes and scooters, car-share, ride-share, bike-share, and AV shuttle.
10. Experience Columbus – Experience Columbus, Columbus' tourism agency, holds a contract with IKE Smart City for the deployment of kiosks in the Columbus region. Experience Columbus has been assisting the Smart Columbus team in understanding the needs of residents and visitors when interacting with a kiosk. Experience Columbus has offered to contract for and manage the six kiosks that will be located at the SMH.

11. Orange Barrel Media – Orange Barrel Media is the owner of IKE Smart City, a software company that has created an interactive kiosk to disseminate information to the public and allow for greater mobility around a city. Orange Barrel Media has an agreement with the City to deploy kiosks in the public right-of-way and will be deploying kiosks as part of this project.

The following table provides the role and contact information for the key technical and project stakeholders associated with the system design.

Table 2: Project Stakeholder Contact Information

Name	Role	Email Address
Michael Stevens	Executive Sponsor, Smart Columbus	mhstevens@columbus.gov
Andrew Wolpert	Smart Columbus Deputy Program Manager	adwolpert@columbus.gov
Andrew Kistler	Director of Property Management at Columbus Metropolitan Library	akistler@columbuslibrary.org
Lora Knight	Property Management at the Columbus Metropolitan Library – Linden Branch	lknight@columbuslibrary.org
Marilyn Mehaffie	Chief Executive Officer, St. Stephen's Lead	mmehaffie@saintstephensch.org
Tommy Ferguson	Education Coordinator at St. Stephen's Community House	tferguson@saintstephensch.org
Refai Bassam	COTA Construction Project Manager	refaib@cota.com
Robb Coventry	Director of Facilities at Columbus State Community College	rcoventry@csc.edu
Kori Fowler	Development Manager at Orange Barrel Media and IKE Smart City	kfowler@ikesmartcity.com

Source: City of Columbus

2.2. ROLES

SMH is designed to serve the needs of many different types of users, with features and functions appropriate for each one. Different amenities are offered at the SMH location based on available space. This section will outline the features and functions at a high level for SMH stakeholders.

- **Travelers** are individuals in need of transportation services. Transportation services will include:
 - Car-Share
 - Ride-Share
 - Bike-Share
 - Bike Parking
 - Dockless Device Parking
 - Park and Ride
 - Transit and Paratransit
 - Autonomous Shuttle
 - Interactive Kiosk with Multimodal Trip Planning Application

- Electric Vehicle Charging
- **MMTPA Users** are individuals who want to use the MMTPA application to plan their trip. Travelers have a user account and travel profile, while anonymous travelers do not have an account and can use the system without login. This application can be accessed on a personal device or the interactive kiosk.
- **Interactive Voice Response (IVR) Users** are individuals without a Wi-Fi enabled device and need telephone-based assistance to plan, schedule, or pay for their trip.
- **Provider Administrators** are representatives of organizations that provide transportation services, who need to manage and maintain assets and information on the services they provide.
- **System Administrators** are the “super-users” who manage and maintain the software. At this time, the vendors awarded will perform this role and are responsible for maintaining sites and reporting system stats to the City of Columbus project managers.
- **Wi-Fi Users** are individuals in need of Wi-Fi for internet access to assist with travel arrangements or for other personal reasons. The kiosk will provide Wi-Fi coverage.
- **USB Users** are individuals in need of charging their personal devices during multimodal trips. The kiosk will provide power to a USB charging pedestal.

The City of Columbus will enter into partnership agreements with COTA, St. Stephen's Community House, Columbus Metropolitan Library, and Columbus State Community College for the Smart Mobility Hubs project. Each location may have different amenities which would require different installation and operation and maintenance agreements.

Table 3 identifies the system design roles. This matrix also serves as the list of points of contact for issues and concerns relating to the system design.

Table 3: System Design Roles and Contact Information

Name	Role	Phone	Email
Andy Wolpert <i>City of Columbus</i>	Deputy Program Manager	614-538-7601	adwolpert@columbus.gov
Jeff Kupko <i>Michael Baker International</i>	Project Manager	717-856-7907	jeffrey.kupko@mbakerintl.com
Matt Graf <i>HNTB Corporation</i>	Technical Lead, Design Engineer	614-493-5516	mgraf@hntb.com
Jess Baker <i>HNTB Corporation</i>	Technical and Systems Engineering Lead	407-615-1890	jebaker@hntb.com

Source: City of Columbus

2.3. RESPONSIBILITIES

The items below define the roles for the project.

2.3.1. Deputy Program Manager

The Deputy Program Manager (DPM) is critical to implementation and long-term sustainability of the Smart Columbus Program. The DPM is the primary point of contact for technical advisors, is responsible for maintaining regular interaction with USDOT leadership, and is responsible for program delivery.

2.3.1.1. RESPONSIBILITIES

- Primary point of contact for senior technical advisors
- Manages all stages of the project
- Manages and directs procurement, reporting, and auditing of the program
- Manages the technical activities and deliverables, City department support, and implementation partner support
- Leads periodic reviews for safety and quality assurance/quality control (QA/QC)

2.3.2. Project Manager

Project management responsibilities include delivering every project on time within budget and scope. Project managers should have a background in business skills, management, budgeting, and analysis.

2.3.2.1. RESPONSIBILITIES

- Coordinate internal resources and third parties/vendors for the flawless execution of projects
- Ensure that all projects are delivered on time, within scope, and within budget
- Developing project scopes and objectives, involving all relevant stakeholders, and ensuring technical feasibility
- Ensure resource availability and allocation
- Develop a detailed project plan to track progress
- Use appropriate verification techniques to manage changes in project scope, schedule, and costs
- Measure project performance using appropriate systems, tools, and techniques
- Report and escalate to management as needed
- Manage the relationship with the client and all stakeholders
- Perform risk management to minimize project risks
- Establish and maintain relationships with third parties/vendors
- Create and maintain comprehensive project documentation

2.3.3. Design Engineer

The Design Engineer is responsible for all design elements of SMH.

2.3.3.1. RESPONSIBILITIES

- Review project requirements to understand how to design the plans
- Conduct site visits to ensure nothing will impact the design plans
- Draft all design plans
- Walk stakeholders through design plans

2.3.4. Technical Lead

Technical Lead is responsible for all facets concerning information technology (IT), including IT infrastructure (servers, storage, databases, etc.), communications (fiber, switches, routers, etc.), software (apps, scripts, programs, etc.). In addition to managing the IT landscape, the technical lead assists vendors with implementation design and developing, tracking, tracing system tests, debugging, and establishing corrective plans. This role will also review system requirements, track quality assurance metrics, and may assist with querying or collecting data, developing dashboards, and reporting for measuring project performance. Additional responsibilities as they relate to system design are listed below.

2.3.4.1. RESPONSIBILITIES

- Review requirements, specifications, and technical design documents to provide timely and meaningful feedback
- Create detailed, comprehensive, and well-structured test plans and test cases for the implementation of MMTA onto the kiosk
- Estimate, prioritize, plan, and coordinate testing activities
- Identify, record, and document thoroughly any issues that arise through testing
- Ensure operation of the kiosk per contract requirements
- Ensure signage is appropriate for hub amenities
- Track quality assurance metrics
- Stay up-to-date with new testing tools and test strategies

2.4. PROJECT AGREEMENTS

The City is bringing together various organizations to deliver the amenities in scope for the SMH project, including City partners, local businesses, vendors, and other organizations contributing to the delivery of the project. As a result, the City anticipates it will engage in various agreements among these stakeholders as outlined and described in below.

Table 4: SMH Anticipated Agreements

Name	Description
City-SMH Location Partner Service Coordination Agreement	An agreement between the City and each SMH location owner (COTA, Columbus Metropolitan Library, Columbus State Community College, and St. Stephen's Community House) stipulating coordination, information sharing, and other aspects of service provision relevant between cooperative services.
SMH Partner Locations-Mobility Providers Shared Operations Agreement	An agreement between the SMH partner locations and mobility providers documenting responsibilities for all activities associated with shared systems being operated and/or maintained.
SMH Partner Locations-Bike-Share Provider Placement and Operations Agreement	An agreement that enables the bike mobility provider to install and operate docking stations at the SMH partner locations.

SMH Partner Locations-Kiosks Vendor Device Placement and Operations and Maintenance Agreement	Agreements between the SMH partner locations and the kiosks vendor that enable the kiosk provider to deploy SMH kiosks at designated locations and defines operations and maintenance of the SMH kiosks.
City-Kiosks Vendor Device Placement and Operations and Maintenance Agreement	An agreement between the City and the kiosks vendor that enables the kiosk provider to deploy SMH kiosks at designated locations and defines operations and maintenance of the SMH kiosks.

Source: City of Columbus

Chapter 3. Design Concerns

3.1. SMART MOBILITY HUB DESIGN CONCERNS

The design and development of hub facilities, amenities, connected mobility, and transportation services is one of the key enablers and success metrics for the SMH project. Each hub will be a place of development, expansion, and mixed land use, with a high degree of transit riders, pedestrian, and cyclist priority, and a strong sense of a mobile community that provides seamless access to various modes. Through the various stages of the project, the team identified several items (risks, concerns, or opportunities) that influenced and/or guided the design process, including the following:

1. Configured SMH infrastructure layout to maximize accessibility to traveler and transportation service providers, minimized disruption to existing facilities and operations, and provided safe spaces for travelers to access SMH services.
2. Designed SMH locations to accommodate future expansion of services.
3. Planned SMH infrastructure to be located within existing right-of-way (ROW) when possible to minimize the impact to private stakeholders and reduce the number of subsequent agreements that will be required to operate the facility. There were several factors which made this unavoidable, including:
 - a. Lack of existing ROW space to physically install SMH components (Linden Transit Center)
 - b. Specific elements of the SMH facility utilizing parking areas/paved areas located within private stakeholder property (Linden Transit Center, Metro Library, Northern Lights Park and Ride)
 - c. SMH site located entirely within private stakeholder property (St. Stephen's Community House, Easton Transit Center)
4. Planned construction activities will directly impact the construction of the Columbus State Community College SMH facility. Coordination efforts have been ongoing to align construction schedules for both projects to prevent direct conflicts or a "dig twice" scenario.
5. Geometric constraints due to existing conditions directly affected the possible configurations for the layout of SMH site improvements. These constraints included:
 - a. Physical obstructions such as signal and lighting poles, utilities, buildings, drives
 - b. Maintaining Pedestrian Accessible Routes (PAR) and curb ramp clearance
 - c. Maintaining clear zones for Stopping Sight Distance (SSD) at intersection locations
 - d. Limited right-of-way
6. Power service for the kiosks is a low-risk item of discussion for the project team. Although built by the kiosk vendor through a separate construction process, the location and connection of power is a project deliverable that the SMH team will monitor and support.





Chapter 4. System Decomposition







As the city continues to grow, the City intends on managing the increasing demands on the transportation network in ways that engage and promote community and make modal transport efficient. SMH facilities are places of connectivity where different modes of travel – walking, biking, transit, and shared mobility options – come together in one place to help people make connections quickly and get to where they need to go.

Chapter 5 provides further details about each SMH facility, describing the amenities, services, and technologies (software and hardware) that work together to help people connect while providing more transportation options.

The SMH implementation strategy provides advanced access to mobility options and trip planning tools. The amenities tabulated below are planned for deployment:

Table 5: Smart Mobility Hub System Amenities

	<p>Interactive Kiosk</p> <p>The interactive kiosk (IK) is a stand-alone, self-service system that provides a communication platform to deliver a variety of services to travelers as described in the sections to follow. The IK is comprised of several subsystems:</p> <ul style="list-style-type: none">• Traveler Information Service – this subsystem will leverage the kiosk communication interface to provide travelers transportation related and community centric information services. This includes web-based access to MMTPA’s CTP service and access to other systems via software interfaces. It encourages city exploration by providing information on various points of interest, business listings, and live transit info using the touchscreen.• Emergency Call Service – this subsystem consists of a physical button, an addition to the kiosk, that when activated will send notification of the help request directly to the 911 emergency call center(s) and initiate an audio connection between the distressed traveler and an operator at the emergency call center.• Wireless Internet – this subsystem provides complimentary, publicly accessible Wi-Fi at SMH locations for travelers using a personal wireless device to access the internet services.• Device Charging – this subsystem consists of a hub of USB ports that enable charging for mobile devices.
	<p>Ride-Share Pickup/Drop-Off Zone</p> <p>Pick-up and drop-off zones will be made available at selected SMH facilities in the form of pull-off lanes and/or parking spaces located away from travel lanes that allow the safe transfer of passengers for ride-sharing opportunities.</p>
	<p>Car-Share</p> <p>Car-share is a service that provides access to a vehicle for short-term use. Travelers who are members of the car-share service can automatically rent a vehicle by the hour, the day, or overnight. A variety of makes and models are parked within designated car-share parking zones and are accessible 24/7.</p>
	<p>Dockless Device Parking</p> <p>Dockless parking services are areas that include designated zones for parking dockless devices such as scooters and e-bikes. Travelers will be able to continue a trip by renting a dockless bicycle, scooter, or e-bike at one location and end the trip anywhere they choose.</p>

	<p>Park and Ride</p> <p>Designated parking spaces will be available at select SMH locations and allow a traveler the option to complete a segment of his or her trip using a personal vehicle and parking at a SMH facility, where he or she can utilize the SMH amenities to continue his or her trip using alternate modes of transportation.</p>
	<p>Bike-Share Docking Station</p> <p>Bike-share services are a transportation service designed to provide travelers with a convenient way to make short trips along the corridor. Amenities associated with this service includes bike rentals, privately operated bike-share docking stations, and the back-end software system. These bikes are intended to move from station to station and be parked at a dock.</p>
	<p>Bicycle Parking</p> <p>Outdoor bicycle racks are a common short-term bike parking option offered at the SMH facilities for personal bicycles.</p>
	<p>Bus Service</p> <p>COTA will provide access to its existing transportation facilities along the Cleveland Avenue corridor to facilitate development of the proposed SMH amenities and ease of access to COTA CMAX and other transit services for travelers. Most of the facilities were located at or near CMAX stations.</p>
	<p>Electric Vehicle Charging Station</p> <p>An electric vehicle charging station is equipment that provides a source of electricity to charge plug-in electric vehicles at designated SMH facilities. Deployment of electric vehicle supply equipment is important to City of Columbus zero emission vehicle planning and is planned as part of the car-share deployment within the Columbus State Community College mobility hub. .</p>
	<p>AV Shuttle Service</p> <p>The City of Columbus is currently planning on enabling pick-up and drop-off transportation using autonomous vehicle (AV) shuttles at select SMH facilities.</p>

Source: City of Columbus

4.1. INTERACTIVE KIOSKS

The IK is a self-service solution that addresses the City of Columbus needs for traveler information, emergency response services, complimentary wireless internet connectivity, and handheld device charging. The IK is a subcomponent of MaaS within the context of SMH.

The City of Columbus has chosen to deploy the Interactive Kiosk Environment (IKE) product, a turn-key kiosk device from IKE Smart City. It is important to note that the design for a turn-key solution/system falls within the realm of the vendor as products are prepared for market release. In the context of SMH, the project specifies “what” design components are required (e.g., touchscreen display, Wi-Fi, emergency call button, etc.) in order to achieve the desired service-related outcomes established through the project’s system engineering process (ConOps, SyRS, ICD, SDD, etc.). A turn-key system means the vendor’s product already integrates the technical “how-to” mechanism for executing what is required and the project’s role is providing detailed configuration information to tailor and customize the product(s), fit for purpose. For instance, the City wants to provide Travelers with wireless internet connectivity. Since this service will be

provided by the turn-key kiosk, this SDD does not specify what circuit board, network interface components, or firmware is required to “design a wireless service.” Rather, the document specifies the standards to be followed, level of service and availability, as well as any data that should be collected to remain compliant with City governance policies and meet the project requirements.

At a high-level, the IK System consists of three types of physical objects – the kiosk field device, a central management system (IK-CMS), and various data sources. The IK is an IP-addressed device that establishes a connection to the IK-CMS and data sources over-the-air (wide area wireless). **Figure 1** below provides a brief overview of the physical model of the IK System along with basic flows between objects. Additional details will be provided for each subsystem of the kiosk in its respective section.

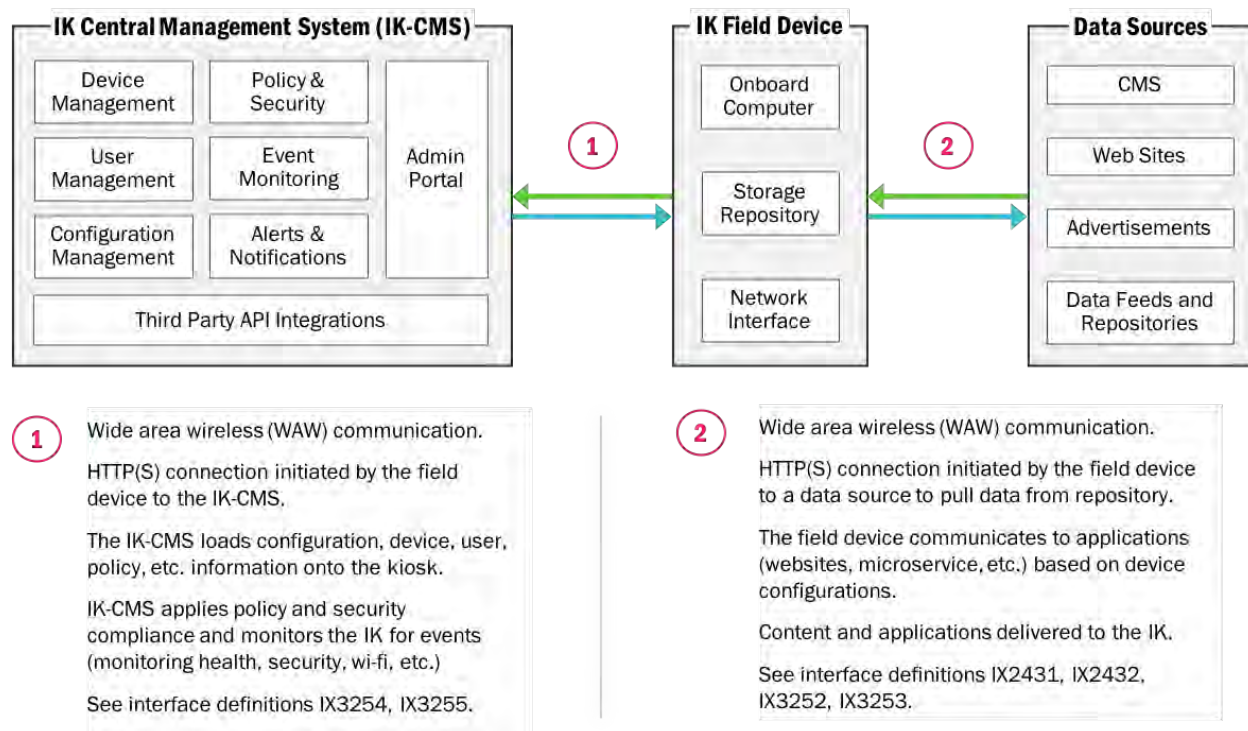


Figure 1: IK Physical Model

Source: City of Columbus

This kiosk device has been verified to be configurable and customizable to the City’s specifications detailed in this document and also meets all system requirements established through the SyRS. In addition, the unit is versatile and allows custom branding on the units themselves, which provides a sense of identity unique to each location. **Figure 2** provides an overview of the custom branding options provided by IKE.

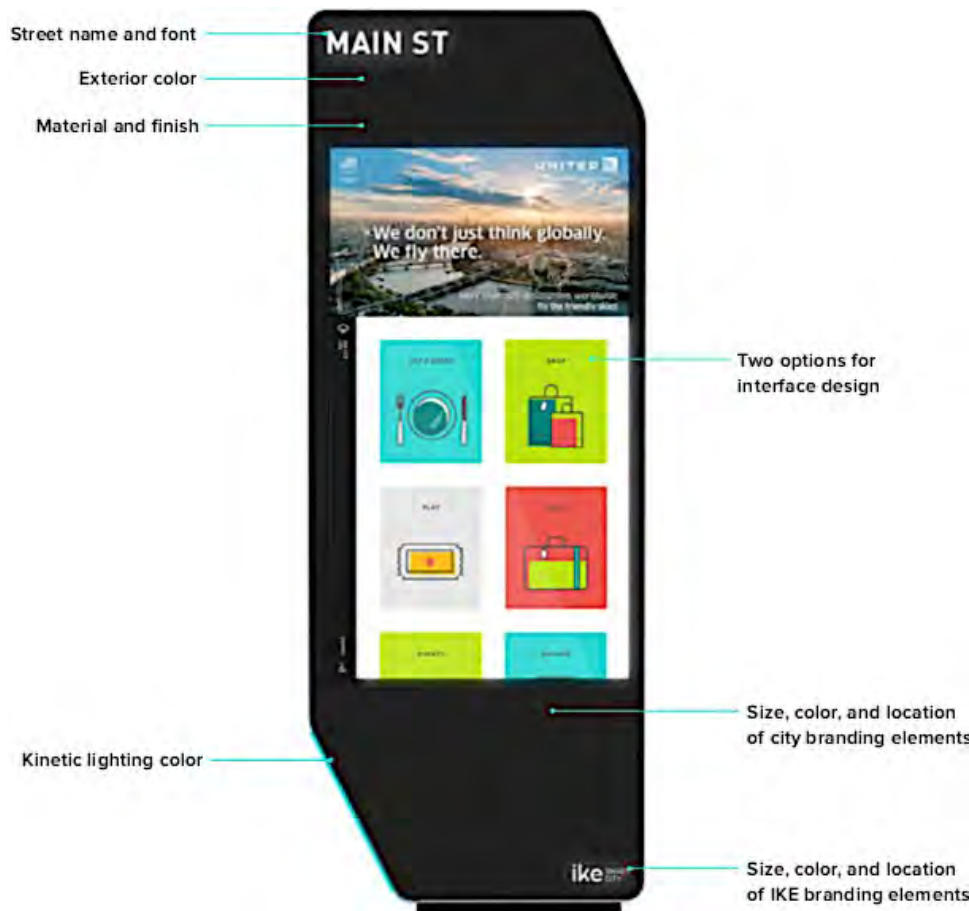


Figure 2: IK Custom Branding Options

Source: City of Columbus

At this time, site-specific customization has not been established, albeit the kiosks will likely be branded similar to the existing kiosks within the region. IKE Smart City will work closely with the City of Columbus to create a custom design that reinforces the City's brand and adds vibrancy and visual interest to the surrounding areas.

The following information describes the subsystems that make up the IK System.

4.1.1. Traveler Information Subsystem

The traveler information subsystem refers to the 65" kiosk which provides travelers with a digitalized custom experience delivering on-demand information and trip planning services to help navigate the city. It is designed for outdoor engagement and digital advertising with Smart City features including pedestrian interactivity and analytics.

Customer satisfaction surrounding the SMH (kiosk use, usefulness, and accessibility) are key SMH performance objectives and therefore, the IKE will offer a suite of applications to encourage city exploration by providing wayfinding, points of interest, business listings, access to multimodal trip and live transit information, and location specific content. It is designed to enhance information sharing for residents and visitors of all economic means; economic development, and neighborhood organizations such as business improvement districts, travel and tourism bureaus, workforce development, and multiple city agencies.

The IK System design shown in **Figure 3** provides an overview of the IK's technical design.

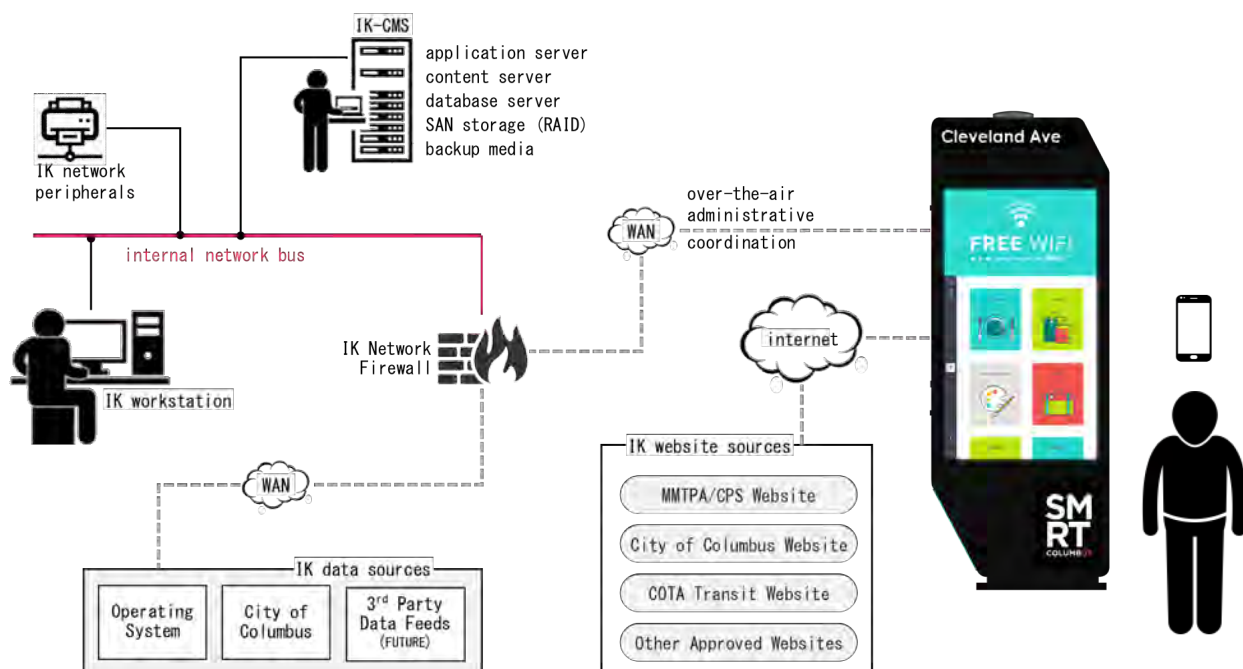


Figure 3: IK Traveler Information System Design

Source: City of Columbus

4.1.1.1. SYSTEM SERVICES

- **Comprehensive Trip Planning (CTP)** – this service is provided to travelers through the kiosk touchscreen interface via an internal browser iFrame, proprietary to the kiosk design (by vendor). IK System administrator grants access to MMTPA/CPS mobile website through configuration of a uniform resource locator (URL) on the kiosk. This is accomplished via interface IX2431, IX2432.
- **Application-Based Services** – this service is provided by the IK, unique to the kiosk product and includes location-specific content management, digital advertising, local entertainment, events, announcements, business listings (dining, shopping, etc.), and future content expansion. These services are configured by the IK System administrator from the IK-CMS portal or IK-workstation via interface IX3254, IX3255.

Figure 4 below provides an overview of the applications that are offered out of the box from the kiosk vendor. The final list of applications included on the kiosk will be determined based on the needs of the community but all kiosks will include the MMTPA product. The City of Columbus is actively developing agreements with SMH stakeholders. While the IK applications are expected to be the same on each IK, site-specific opportunities around content (i.e., job opportunities or site event information) will be reviewed, discussed, and defined during the development of such agreements.

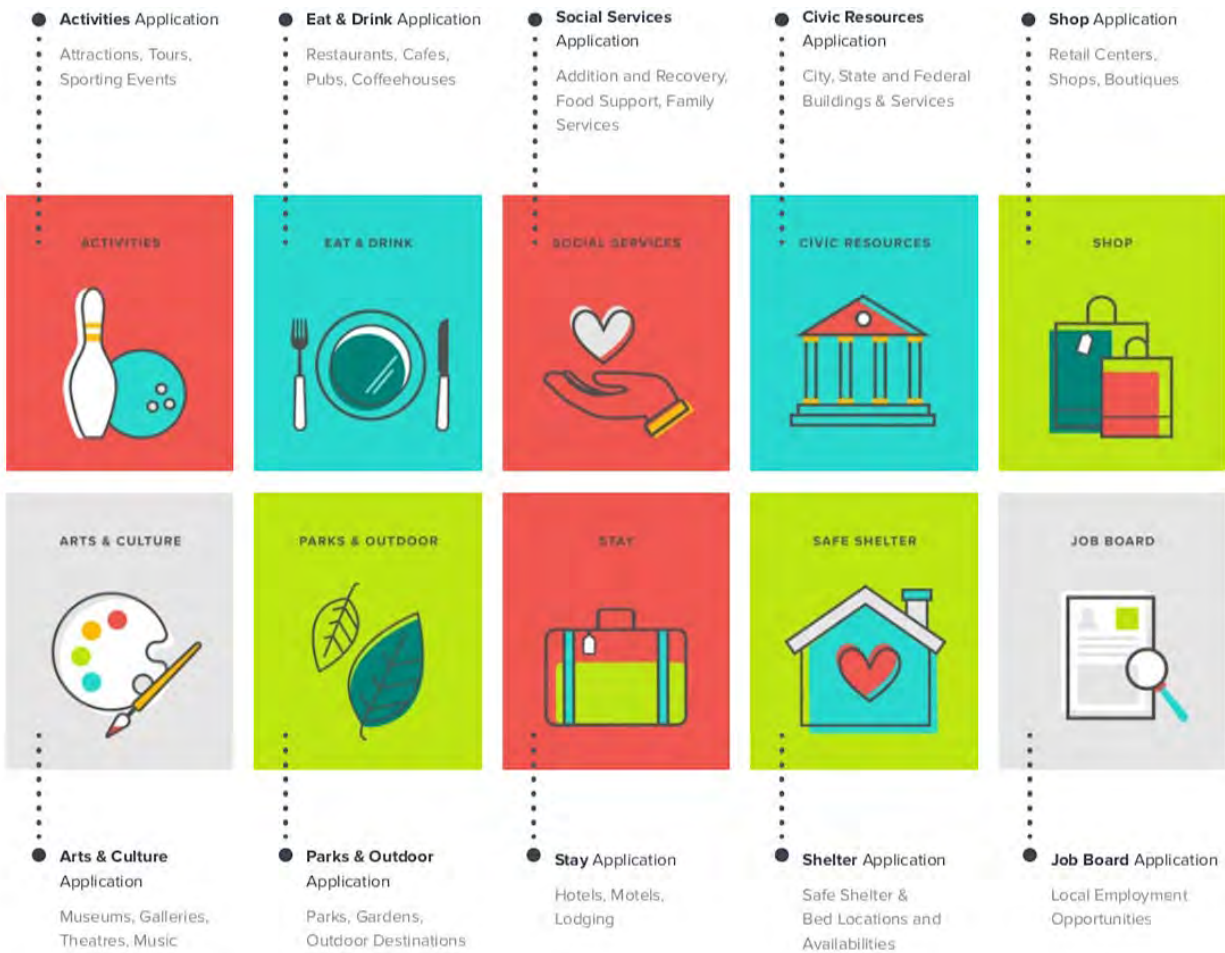


Figure 4: Interactive Kiosk System Applications

Source: City of Columbus

4.1.1.2. USER NEEDS ADDRESSED

- City: SMH-UN001-v01, SMH-UN002-v01
- Traveler: SMH-UN003-v01, SMH-UN006-v01, SMH-UN008-v01, SMH-UN010-v01, SMH-UN012-v01
- COTA: SMH-UN013-v01

4.1.1.3. COMPONENTS

The City of Columbus is deploying the IK System product through IKE Smart City. As such, the City of Columbus will be deploying a turn-key product that will be tailored and configured to meet the needs of the SMH project. **Table 6** details the components specific to the IKE system, detailing the out-of-the-box features that will be leveraged to meet the requirement established through the SyRS. Specific design elements, where appropriate, have been captured in the table below and requirements that have been met as part of a particular component listed in the table are traced in the reference column.

Table 6: Interactive Kiosk System Components

Component	Description	Reference
IK Field Device	<ul style="list-style-type: none"> The kiosk is organized around a physical touchscreen monitor sensitive to touch and is the unit's main input/output device and interface to SMH travelers. The kiosk provides access to traveler information at select SMH facilities, including MMTPA'S CTP service with IVR support. Generally co-located with transit stations, transit stops, and major trip generation locations (i.e., SMH facilities). Each device is uniquely identified with an IP. Customizable aesthetics including colors and signage ADA compliant Supports static and dynamic imagery Dual sided auto dimming monitors up to 4,000 nits, ensures visibility day or night, in any weather condition Top of the line projected capacitive touchscreens, auto-fixing and multitouch Custom air conditioning and heating system Environmental Control System keeps equipment running in an operable environment, including cloud power management and system monitoring Multilanguage supported (default to English) Laminated tempered glass, aluminum (corrosion resistant) construction, and security locks keep hardware safe from environmental factors and the public including vandalism Kiosk is also equipped with additional features which will be discussed in its respective section (e.g., audiovisual hardware, emergency call button, and Wi-Fi) 	SMH-EN2330-V01 SMH-FN2335-V02 SMH-FN2441-V01 SMH-FN3058-V01 SMH-FN3061-V01 SMH-IF2315-V01 SMH-IF2316-V01 SMH-FN2338-V01 SMH-PY2369-V01 SMH-PY3066-V01 SMH-FN2342-V01 SMH-IF2356-V02 SMH-IF2357-V01 SMH-DR2328-V01 SMH-DR2329-V01 SMH-EN2333-V01 SMH-FN2346-V01 SMH-FN2348-V01 SMH-FN2350-V01 SMH-FN2351-V01 SMH-FN2448-V01 SMH-LC2460-V02 SMH-PR2452-V01 SMH-PR3062-V01 SMH-FN2352-V02 SMH-FN2353-V02 SMH-FN2354-V02 SMH-FN2359-V02 SMH-FN3059-V01 SMH-IF2360-V01 SMH-IF2361-V01 SMH-IF2362-V01 SMH-FN2347-V01

Component	Description	Reference
IK Central Management System (IK-CMS)	Kiosk field equipment is managed by a central management system. The IK-CMS must be deployed such that there is no single point of failure (e.g., clustered, backups, load balanced, etc.) in order to meet the requirements.	SMH-AR2326-V02 SMH-FN2336-V01 SMH-FN2337-V02 SMH-MT2367-V01 SMH-SR2378-V01 SMH-SR2379-V01 SMH-FN2339-V02 SMH-EN2332-V02 SMH-RG2374-V02 SMH-FN2341-V02 SMH-IM2365-V01 SMH-IM2366-V01 SMH-FN2343-V02 SMH-FN2345-V01 SMH-FN2349-V02 SMH-FN2340-V02
IK Workstation	The workstation represents the administrative human interface the IK vendor uses to access the IK System (e.g., a laptop, desktop, tablet, etc.). The vendor is responsible for access to the IK System to perform maintenance and routine administrative tasks. Therefore, human interfaces are not tracked in this regard.	SMH-MT2368-V01 SMH-SR2453-V02 SMH-IM3069-V01
IK Network Peripherals	The IK network peripherals represent additional system components that may be a part of the vendor design, such as tape backups, off-site secondary servers, UPS, etc., required to produce the outcomes stated in the SyRS.	SMH-EN2332-V02
IK Network Firewall	The IK network firewall protects detects, prevents, and responds to cybersecurity incidents to guard against intentional and unintentional threats to the integrity of the IK System components arising from unauthorized access, computer viruses and worms, system abnormalities or faults, and other sources of potential harm.	SMH-SR2376-V01 SMH-SR2377-V01
Internal Network Bus	The internal network bus represents the domain-protected communications infrastructure that connects various components of the IK System. Components of the system could be on fiber or federated and protected by SSL VPN or BO VPN.	SMH-SR2380-V01 SMH-IF2355-V02
IK Data Sources	Represents the various data sets configured to send/receive data with the kiosk, including the Operating System. The IK accepts various forms of data formats, including PDF, images, text files, and JSON feeds. All sources that interact with SMH-related data will abide by the City's DMP and DPP policies; governed by agreements established.	
IK Web Sources	Web sources represent all HTTP and HTTPS communications over the internet.	

Source: City of Columbus

4.1.1.4. DATA AND MESSAGE FLOWS

The data and message flows, standards, and protocols were established through the SMH interface control. Refer to the SMH ICD for additional details of the data and message flows for the IK's traveler information subsystem. **Table 7** provides traceability for the data and message types expected along with the interface by which the information will be provided, along with identification of the source and destination.

Table 7: Interactive Kiosk Data and Message Type

Interface	Source	Destination	Message Type
Interface 1.1 SMH-IX2431-V01	Field IK	MMTPA	<ul style="list-style-type: none"> Request for trip planning services including feedback for services (car-share, ride-share, bike-share, paratransit) Traveler profile information (including default payment type) Trip confirmation
Interface 1.2 SMH-IX2432-V01	MMTPA	Field IK	<ul style="list-style-type: none"> Web pages (http) with images and GIS map data, real-time information on public transportation, request prompts for trip planning (e.g., source location selection, destination location selection, mode selection etc.) Trip plan – including activation codes, turn-by-turn directions with mobile integration to transfer those directions to mobile devices or tablet
Interface 6.1 SMH-IX2431-V01	Traveler's Personal Device	MMTPA's IVR System	<ul style="list-style-type: none"> Booking initiation
Interface 6.2 SMH-IX2431-V01	MMTPA's IVR System	Traveler's Personal Device	<ul style="list-style-type: none"> Trip initiation confirmation
Interface 8.1 SMH-IX3254-V01	Field IK	IK-CMS	<ul style="list-style-type: none"> IK usage Physical and administrative Wi-Fi security administration Wi-Fi compliance administration Emergency call logs
Interface 8.2 SMH-IX3255-V01	IK-CMS	Field IK	<ul style="list-style-type: none"> Content management Administrative coordination
Interface 8.3 SMH-IX999-V01	Field IK	External Data Sources	<ul style="list-style-type: none"> Future data sources
Interface 9.1 SMH-IX3256-V01	IK-CMS	Operating System	<ul style="list-style-type: none"> Operational usage data
Interface 9.2 SMH-IX3258-V01	Operating System	IK-CMS	<ul style="list-style-type: none"> Data feeds

Source: City of Columbus

4.1.1.5. NETWORK AND COMMUNICATIONS

The IK shall comply with wide area wireless (WAW) communications system that offers broad coverage, enabling communications between the IK, traveler, and mobile devices at any location employing IEEE 802.11 standard, IPv4, IPv6 (or dual stack), and IPSec for VPN. Uses are as follows:

- Bidirectional between IK IK-CMS
- Bidirectional between IK and MMTA
- Bidirectional between IK-CMS and Operating System
- Bidirectional between a Traveler's Personal Device and MMTA's IVR system

4.1.1.6. INFORMATION TECHNOLOGY HARDWARE COMPONENTS

Table 8 details the hardware components specific to the IKE system. Custom design elements, where appropriate, have been captured in the table below.

Table 8: Interactive Kiosk Hardware Components

Class	Specification
ADA Compliance	Minimum touchscreen height (ADA enabled) = 15 inches
	Maximum touchscreen height (ADA enabled) = 48 inches
	Side reach maximum (i.e. footing-to-screen distance) = 10 inches
	Leading edge of protrusion must be less than 27 inches
Electrical Requirements	50A @ 110V (or 2X 20A @ 110V)/20A @ 220V/optional 277V
	Max power consumption ~3783W (basic features)/~4020W (all features)
	Designed, inspected, and labeled to UL standards
Footing/Structural	To be designed by regionally licensed structural engineers to meet exact location requirements. These requirements take into consideration wind loads, soil types, regional codes and other site conditions.
	Soil bearing pressure = 1,500 psf & coefficient of friction = 0.30
	Wind Speed V(asd)= 81 mph (3 seconds), V(ult) = 105 mph (3 seconds)
Environmental Conditions	Operating temperature: -30°F to 130°F
	Operating humidity: 5% to 95%
	Protective door glass is tempered and laminated with optical clear resin
	Dust and water resistance to a rating of IP-56
	Designed for 20" flood water line
Display	Dynascan Model (DS652LR5)
	Power Consumption: 740W max each
	Screen size: 64.53 inches
	Screen type: IPS LCD
	Orientation: Portrait

Class	Specification
	Direct LED backlit, Brightness: 4000 nits
	Active Image Area: 56.2 x 31.6 inches. (1428.5 x 803.5 mm)
	Resolution: 1920 x 1080, Aspect Ratio: 16:9
	Viewing angle: (H x V) 178° x 178°
	Dimmable based on ambient light sensor
	Lifetime 50,000 hours
Connectivity	Mobile Modem, LTE Advanced with SIM-based auto-carrier
	Fiber Optics
	Copper
Air Conditioner	110V, 220v -optional
	Power consumption ~1400W
	Dual compressor
	12K BTU
	12 x 16 custom air filter
Physical	Approximate weight: ~800 lbs.
	Size: (H x W x D) 99.5" x 37.5" x 16"

Source: Pentagram IKE

4.1.1.7. ENGINEERING AND CONSTRUCTION DESIGN

The following section provides civil engineering and construction views of the kiosk system design. The design specifications in **Figure 5** shall be effective for all SMH facilities.

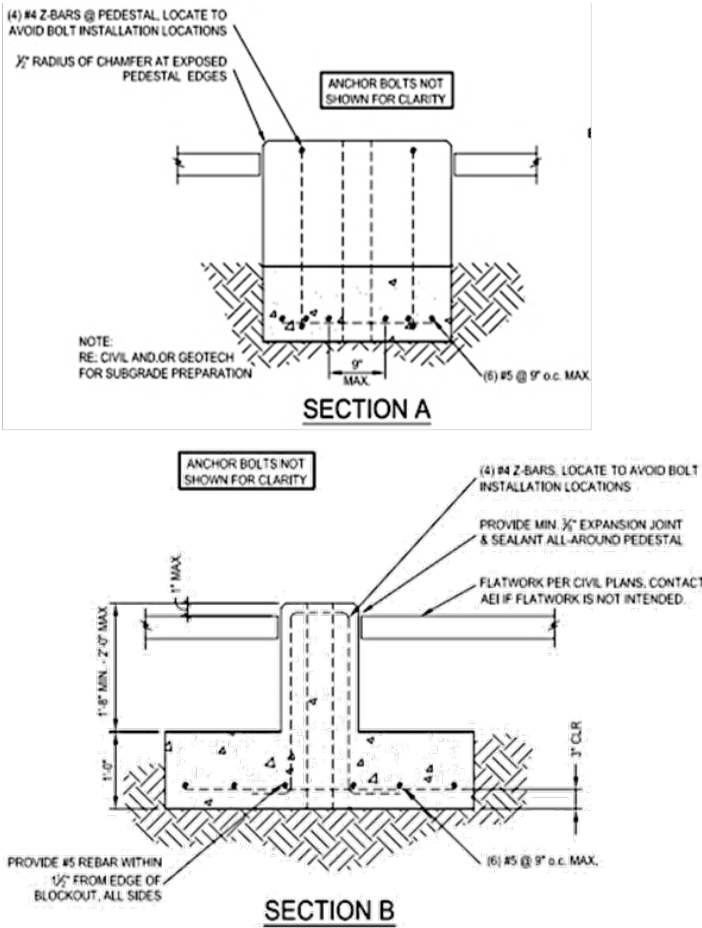
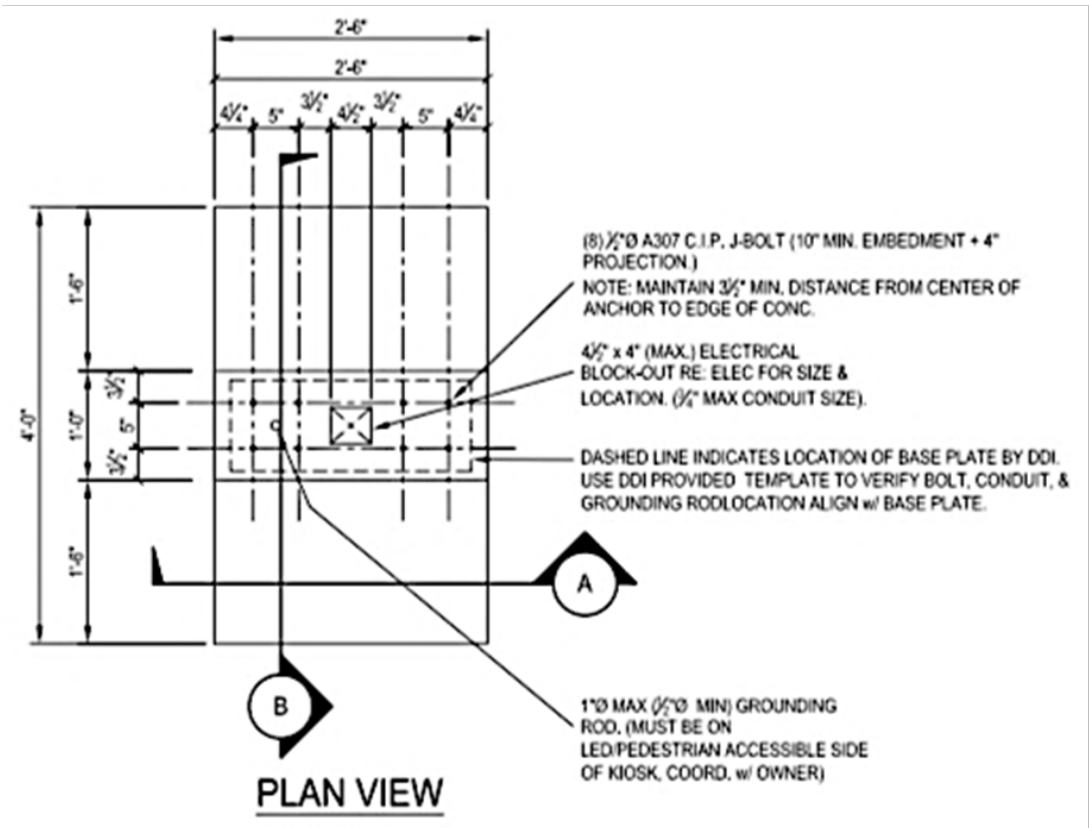


Figure 5: Interactive Kiosk Foundation Design

Source: City of Columbus

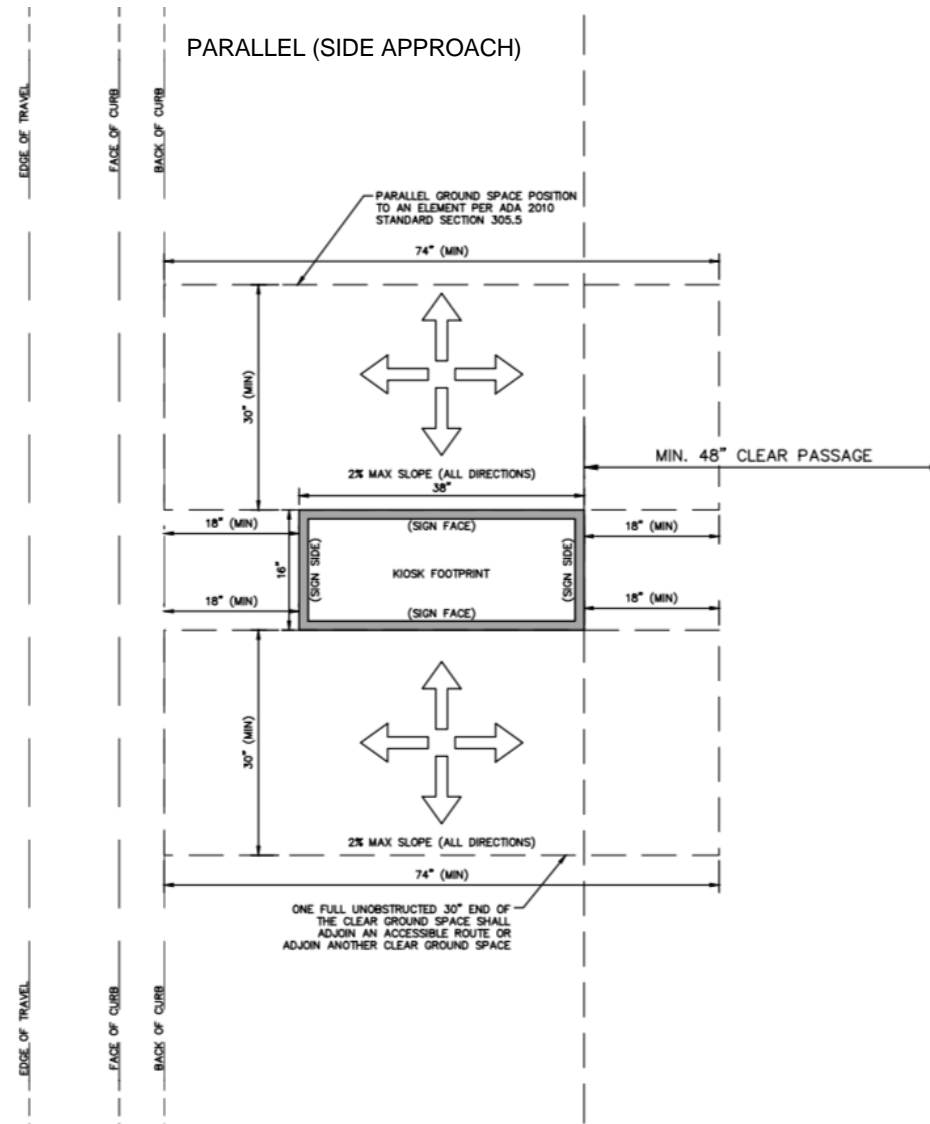
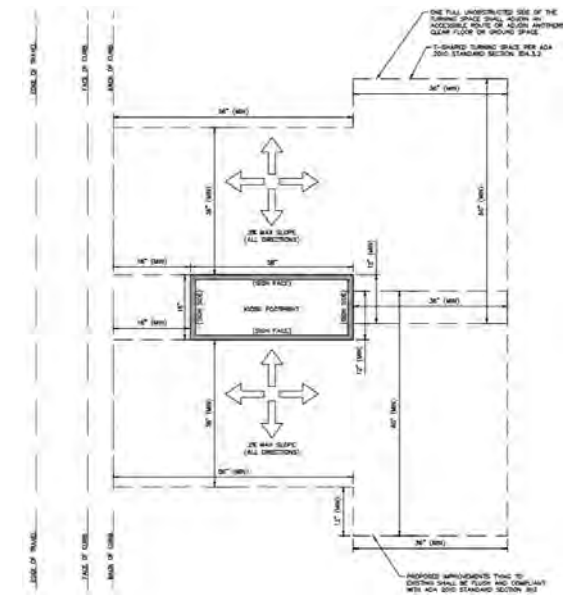
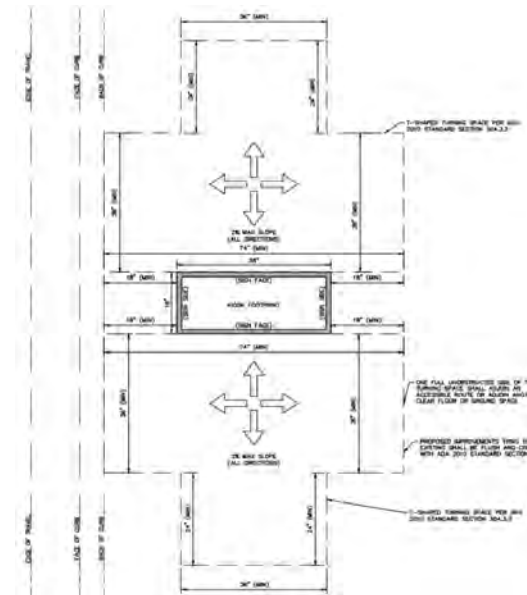
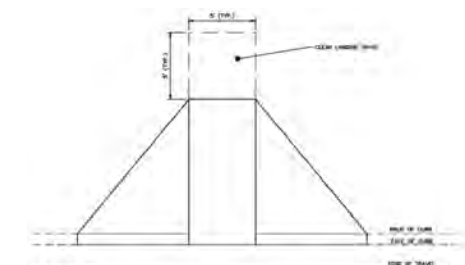


Figure 6: ADA Pedestrian Accessibility (Ground Space Position to Kiosk)

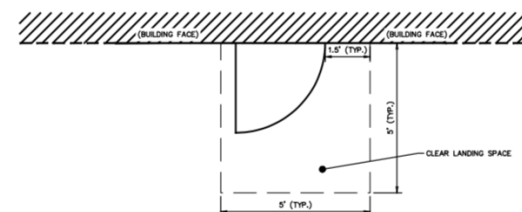
Source: City of Columbus



TYPICAL ACCESSIBLE RAMP LANDING



TYPICAL DOOR LANDING



4.1.1.8. KIOSK FOUNDATION DESIGN STRUCTURE

- Governing Building Code – International Building Code (IBC) 2015 Edition
- 2010 ADA Standards for Accessibility Design
- Assumed Foundation Assigned Parameters
 - Soil Bearing Pressure: 1,500 psf
 - Coefficient of Friction: 0.30

4.1.1.9. PHYSICAL LOADS AND FORCES

The following structural information is designed to be used as a guide, in conjunction with the plans of all other disciplines working on the project. The contractor awarded is responsible for the coordination of all required information.

- Dead Load: 700 lbs
- Wind:
 - Nominal Design Wind Speed, $V(ASD) = 81$ mph (3-second gust)
 - Ultimate Design Wind Speed, $V(ULT) = 105$ mph (3-second gust)
 - Exposure – C
 - $p = 27.7$ psf
- Seismic
 - Design Category = B
 - Risk Category = I

4.1.1.10. MATERIALS

The foundation of the kiosk is based on “Building Code Requirements for Reinforced Concrete” (ACI 318 Latest Edition). Concrete work for all SMH sites shall conform to “Specifications for Structural Concrete for Buildings” (ACI 301 Latest Edition). Hot and cold weather shall be in conformance with ACI 305 and ACI 306 respectively.

4.1.1.11. REQUIREMENTS TRACEABILITY

Hardware design as outlined above meets the following requirements established in the SyRS:

- SMH-RG2373-V01
- SMH-PY2370-V01
- SMH-PY2372-V01
- SMH-PY3065-V01
- SMH-PY3067-V01

4.1.2. Emergency Call Button Subsystem

The emergency call button (ECB) is a subsystem of the kiosk designed for public users to alert Emergency Call Center officials in an emergency situation. The button is located on the kiosk itself and functions as a switch. When pressed, the circuit is closed whereby activating the ECB service (i.e., state change to activated-on). When the button is not pressed, the circuit is open and ECB service is not-engaged, rather on standby. The switch is never regulated by power; meaning, it does not have an “off” mode. It will be available for activation 24x7x365 except during planned maintenance, pre-arranged with the City of Columbus and the Emergency Call Centers (ECC), City of Columbus and Franklin County. When the call button is activated by the traveler, the IK initiates a direct voice over internet protocol (VoIP) audio connection to the ECC using the kiosk’s internal wireless network, where an incident/event distress notification along with location-specific information will be sent to the ECC for call responders.

4.1.2.1. SERVICES

- Emergency Response Services

4.1.2.2. USER NEEDS ADDRESSED

- City: SMH-UN001-v01, SMH-UN002-v01
- Traveler: SMH-UN007-v01, SMH-UN010-v01
- City of Columbus Dispatch Center: SMH-UN015-v01

4.1.2.3. COMPONENTS

The reliability of the wide area wireless connection, quality of service (QoS) of VoIP for audio transmission and other information technology elements (network prioritization, bandwidth, congestion, etc.) have an impact on the speed and effectiveness of the emergency service. IK field devices that send, receive, and process data quickly will enable the ECC to convert incoming data and requests into information and information into actionable decisions.

The City of Columbus is deploying the IK System product through IKE Smart City. As such, the City of Columbus will be deploying a turn-key product that will be tested to ensure it meets the quality metrics needs of the ECB and emergency response service. **Table 9** details the components specific to the ECB system detailing the out-of-the-box features that will be leveraged to meet the requirement established through the SyRS. Specific design elements, where appropriate, have been captured in the table below.

Table 9: Emergency Call Button System Components

Component	Description	Reference
Kiosk	<ul style="list-style-type: none"> A field device designed to provide transportation-related and community-centric information to travelers in the City of Columbus. The IK is organized around a large, 65" physical touchscreen, sensitive to touch, which travelers use to interact with the device. In the context of ECB, the kiosk is the main interface travelers use to signal for help in an emergency situation and verbally communicate with the responders at the ECC. When activated, the IK begins capturing video. Video associated with an ECB activation is stored locally on the IK and made available to law enforcement only upon request. Kiosks contain in-house computer system capable of storing all static data files (app-based) and up to 14 days of ECB activated video files. 	SMH-AR2318-V01 SMH-DR2320-V01 SMH-DR2321-V02 SMH-EN2317-V01
Button for Emergency Calls	<ul style="list-style-type: none"> A physical button affixed to the exterior of the IK that initiates a direct audio connection to the 911 emergency call center operated by the City of Columbus or Franklin County upon activation by the traveler. 	SMH-IF2325-V01
ECC	<ul style="list-style-type: none"> The Emergency Call Centers (City of Columbus and Franklin County) represent facilities that deliver a set of systems and services that support incident management, disaster response and evacuation, security monitoring, and other security and public safety-oriented applications at SMH facilities. Public safety communications centers include public safety call takers and dispatch centers operated by police (including transit police), fire, and emergency medical services. Emergency Operations Centers portable and transportable systems that support Incident Command System operations at an incident. 	SMH-FN2322-V02 SMH-FN2323-V02
Wi-Fi	<ul style="list-style-type: none"> The physical wireless network interface controller that operates on 802.11a/b/g/n radio signals as the kiosk's integrated communications module to provides travelers with internet connectivity. General internet access data between personal wireless devices and kiosk vendor ISP via Wi-Fi hotspot. All users must accept the general terms and conditions of Wi-Fi usage. Fiber connection is preferred where feasible. Cellular antenna can be used if required. Note that some features may be reduced over wireless connection. 	SMH-FN2323-V02

Component	Description	Reference
Audiovisual	<ul style="list-style-type: none"> An internal video camera for physical imaging, which can serve multiple functions such as snapshot acquisition, user identification, and gesture recognition for traveler security support. Under the scope of the SMH project, video will only be stored following emergency call button activation. Internal audio hardware that connects the kiosks' sound components, connecting the signals from the microphone, speaker, and sound card interfaces. Under the scope of the SMH project, audio will only be used for emergency calls. 	SMH-FN2322-V02 SMH-FN2323-V02
IK-CMS	<ul style="list-style-type: none"> The kiosks' central management system is responsible for capturing metadata surrounding ECB events, such as incident timestamp when an ECB alarm was activated and the incident response (e.g., was police, fire, other emergency personnel dispatched for the incident, etc.). 	SMH-DR2320-V01

Source: City of Columbus

4.1.2.4. DATA AND MESSAGE FLOWS

The data and message flows, standards, and protocols were established through the SMH interface control. Refer to the SMH ICD for additional details of the data and message flows for the kiosk's ECB subsystem.

Table 10 provides traceability for the data and message types expected along with the interface by which the information will be provided, along with identification of the source and destination.

Table 10: Emergency Call Button Data and Message Type

Interface	Source	Destination	Message Type
Interface 2.1 SMH-IX2433-V01	ECB	ECC	<ul style="list-style-type: none"> VoIP audio connection Location-specific information
Interface 2.2 SMH-IX2434-V01	ECC	ECB	<ul style="list-style-type: none"> Emergency response via audio

Source: City of Columbus

4.1.2.5. NETWORK AND COMMUNICATIONS

The ECB will use the kiosk's network and communications interface, which will comply with wide area wireless (WAW) for the IK, as **Section 4.1.1.5** describes. The ECB network and communications uses are as follows:

- Bidirectional audio connection between SMH IK and ECC. ECC is network-isolated and does not receive other data for security reasons.
- The communication standard shall be implemented as VoIP.

4.1.2.6. INFORMATION TECHNOLOGY HARDWARE COMPONENTS

Table 11 provides information on the hardware elements designed for the ECB subsystem. For full details regarding the hardware components specific to the IK System, see **Table 8**.

Table 11: Emergency Call Button Hardware Components

Class	Specification
Button for Emergency Call Activation	Push button will be provided by vendor; however, shall meet ADA as appropriate and system requirement SMH-IF2325-V01.
Audiovisual Interfaces	<p>Internal audio speaker capable of 40-80 db audible sounds. Video camera with output quality of 1920 x 1080 resolution at a minimum of 30 frames per second (fps).</p> <p>Note: cameras capture images of the area surrounding the kiosk. The system will not keep any footage captured by cameras for longer than 15 days unless the footage is requested as necessary to investigate an incident by law enforcement. The IK will not use or disclose data collected by cameras except to improve the functionality and ensure the security of the IK, as necessary to address illegal activity on, associated with or perpetrated against the IK or in the surrounding area or if the disclosure is required by law or in the interest of public safety. The IK will not use facial recognition technology and will not use cameras to track movements throughout the city.</p>

Source: City of Columbus

4.1.3. Wireless Internet Subsystem

The Kiosk (out-of-the-box) is equipped with hardware to establish a wireless network that will be configured and used to provide complimentary public Wi-Fi to the traveling public. The wireless subsystem of the IKE product is also able to provide denser cellular coverage through the placement and configuration of additional wireless access points (WAP), repeaters, and/or other small cell antennas to expand the range of wireless coverage for future scalability of complimentary wireless along the corridor. This establishes foundational support for the creation of 4G networks and enables increased connectivity in the community.

The kiosk will provide Wi-Fi service to personal devices able to receive a wireless Wi-Fi signal and located within close proximity to the kiosk. Travelers will be able to browse the internet, access the MMTA, read email, access instant messaging, and perform other publicly appropriate internet access activities.

4.1.3.1. SERVICES

- Complimentary internet access via Wi-Fi hotspot

4.1.3.2. USER NEEDS ADDRESSED

- City: SMH-UN001-v01, SMH-UN002-v01
- Traveler: SMH-UN004-v01, SMH-UN006-v01, SMH-UN010-v01

4.1.3.3. COMPONENTS

Table 12: Wi-Fi System Components

Component	Description	Reference
Kiosk Wi-Fi	<ul style="list-style-type: none"> The physical wireless network interface controller that operates on 802.11a/b/g/n radio signals as the kiosk's integrated communications module to provides travelers with internet connectivity. General internet access data between personal wireless devices and kiosk vendor ISP via Wi-Fi hotspot. All users must accept the general terms and conditions of Wi-Fi usage. Always-on Wi-Fi capability. Kiosk's internal computer system captures Wi-Fi performance metric data such as bandwidth capacity, administrative security alerts for intrusion detection, inappropriate sites visited. 	SMH-PR3064-V01 SMH-PR2411-V02 SMH-EN2402-V01 SMH-EN2403-V01 SMH-DR2400-V01 SMH-DR2401-V01 SMH-DR2409-V01 SMH-SR2416-V01 SMH-SR2419-V01 SMH-AR2399-V01 SMH-FN2405-V01 SMH-FN2406-V01 SMH-FN2407-V01 SMH-FN2408-V01 SMH-RG2414-V01 SMH-RG2415-V01
Guest Access Profile	<ul style="list-style-type: none"> Configurable internet access. Anonymized browsing. Website filtering system with technical data collection. Guest device blocking when inappropriate usage detected. 	SMH-PR3063-V01 SMH-PR3064-V01 SMH-SR2421-V01 SMH-FN2408-V01 SMH-RG2414-V01 SMH-RG2415-V01

Source: City of Columbus

4.1.3.4. DATA AND MESSAGE FLOWS

The kiosk, managed by the vendor, collects technical information to help operate and provide the Wi-Fi service and other services available on the kiosk, including device type, population demographic information, general device location, foot traffic and frequency of IKE kiosk visits, along with aggregated data showing popular website searches. All technical information collected is anonymized such that the information could not possibly be used to identify an individual user of the kiosk or Wi-Fi services.

The kiosk will not store browsing history or track the websites visited when travelers use their personal device to access the Wi-Fi service. However, the vendor reserves the right to obtain individualized MAC addresses to identify and ban users who engage with the kiosk or Wi-Fi services in violation of the vendor's Acceptable Use Policy and Terms of Use.

For additional details surrounding data and message flows for the kiosk's Wi-Fi subsystem, refer to the SMH ICD.

Table 13 provides traceability for the data and message types expected along with the interface by which the information will be provided and with identification of the source and destination.

Table 13: Wi-Fi Data and Message Type

Interface	Source	Destination	Message Type
Interface 3.1 SMH-IX2435-V01	IK Wi-Fi	Personal Wireless Device	General internet access between personal wireless devices and IK vendor ISP via Wi-Fi hotspot
Interface 3.2 SMH-IX2436-V01	Personal Wireless Device	MMTPA	IK Wi-Fi-enabled access to MMTPA

Source: City of Columbus

4.1.3.5. NETWORK AND COMMUNICATIONS

The Wi-Fi subsystem will use the IK's network and communications interface, which will comply with wide area wireless (WAW), as **Section 4.1.1.5** describes. The Wi-Fi network and communications uses are as follows:

- Bidirectional flow between IK and personal wireless device.
- The communication standard shall be IEEE 802.11.

4.1.3.6. INFORMATION TECHNOLOGY HARDWARE COMPONENTS

Table 14 provides information on the hardware elements designed for the Wireless subsystem. For the full details of the hardware components specific to the kiosk system, see **Table 8**.

Table 14: Wi-Fi Hardware Components

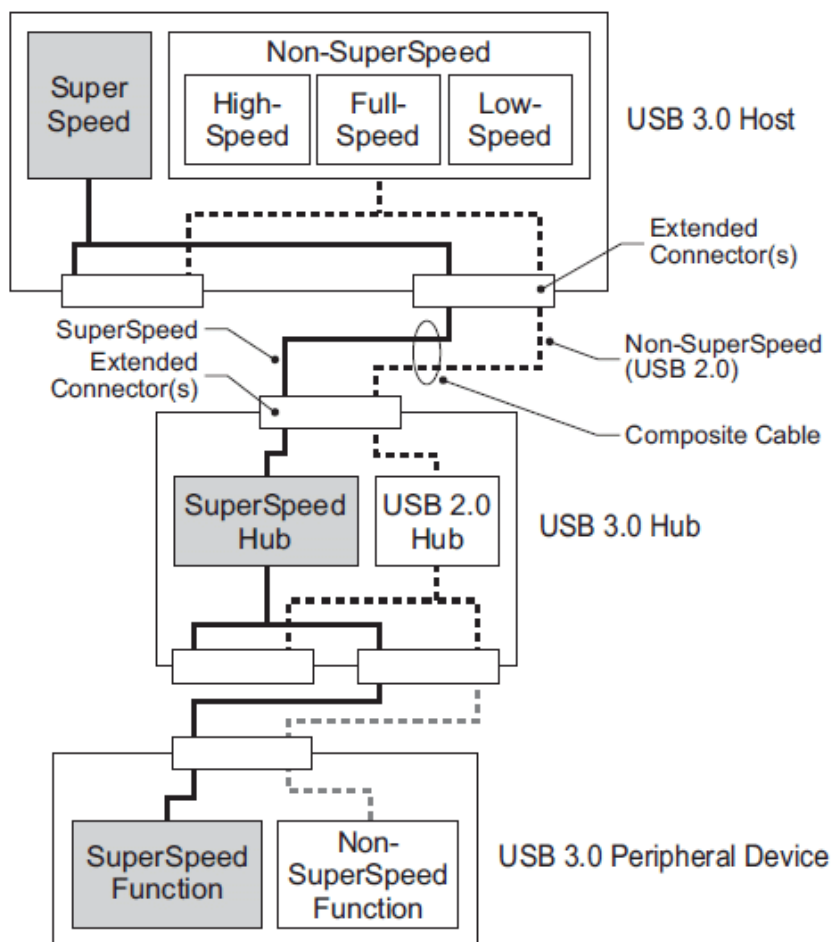
Class	Specification
Wireless Network Equipment	<ul style="list-style-type: none"> • Short-range local wireless networking equipment connects to an internet upstream connection (i.e., ISP), which is then used to share that connection with Wi-Fi enabled personal devices within range. The equipment operates on 802.11a/b/g/n radio signals as the IK's integrated communications module to provide travelers with internet connectivity within 50-75 ft. • Kiosk is equipped with two technologies: Wi-Fi routing and switching or 4G cellular modem technology to deliver wireless internet.

Source: City of Columbus

4.1.4. Device Charging Subsystem

The SMH project will provide travelers with a universal serial bus (USB) device charging station. The station will be equipped with multiple USB ports and a power adapter that generates the 5-volt direct current (DC), as the standard required for a USB. The amperage may vary .07A to 2.4A (mobile devices sense when they connect to a power source and regulate the current drawn accordingly). The charging subsystem will share power or be powered by the kiosk and plugs into a standard, 110 volt alternating current (AC) power source.

Figure 7 provides a technical view of how a standard USB plug provides both 2.0 low or 3.0 super speed to mobile devices. Note the figure is not meant to be a specification design, rather a guide for the hardware to be implemented for this SMH amenity.



Note: Simultaneous operation of SuperSpeed and non-SuperSpeed modes is not allowed for peripheral devices.

Figure 7: Standard USB Plug Design (Dual Architecture for Low and Super Speed)

Source: City of Columbus

Note: **Figure 7** is not meant to be a specification design, rather a guide for the hardware to be implemented for this SMH amenity.

4.1.4.1. SERVICES

- USB charging

4.1.4.2. USER NEEDS ADDRESSED

- Traveler: SMH-UN009-v01

4.1.4.3. DATA AND MESSAGE FLOWS

The USB port available for charging personal mobile devices will be wired for power only – no data connectivity will be supported.

4.1.4.4. NETWORK AND COMMUNICATIONS

The device charging subsystem will use no network and communications. The USB non-network related connection uses are as follows:

- Unicast power delivered to plugged in, USB compatible devices.

4.1.4.5. INFORMATION TECHNOLOGY HARDWARE COMPONENTS

The USB subsystem will be designed to provide charging for multiple personal devices at one time. To achieve this goal, a USB charging hub is planned. Currently the IK does not support the physical installation of one (or more) USB charging ports. The kiosk vendor is currently evaluating potential external USB charging products specifically designed for outdoor usage in the SMH context that will be functionally and aesthetically compatible with the SMH IK. These USB charging stations will derive power from the IK itself or the IK's power source directly but shall be installed external to the kiosk.

Table 15 provides the known hardware elements required for the device charging subsystem.

Table 15: USB Hardware Components

Class	Specification
Universal Serial Bus	Dual architecture – USB 2.0 (low power) or 3.0 (low power SuperSpeed) type-A plug with elongated rectangular cross-section.
USB Hub	Minimum of 4 USB chargers per station.
Power	110V AC delivered

Source: City of Columbus

4.2. MOBILITY INFRASTRUCTURE

4.2.1. Ride-Share

Ride-share is a peer-to-peer vehicle sharing service that relies on an online software platform to connect passengers with drivers using their personal, non-commercial, vehicles. The SMH project will enable ride-sharing for travelers by providing designated pick-up and drop-off zones where the connection between driver and rider can be made quickly and safely.

Figure 8 below provides a very basic and generalized view of how ride-share works. A traveler submits a ride-share request to the mobility provider (software platform) via the MMTPA/CPS (alternatively, the request can be sent outside of the SMH or MMTPA/CPS projects from any Wi-Fi enabled or cellular device. Dotted line paths indicate requests and pairings made outside of the SMH or MMTPA/CPS projects). The MMTPA will provide the necessary coordination with the mobility provider to book a ride-sharing event. Using a proprietary matching algorithm, the mobility provider will determine the most appropriate, optimized driver to which the traveler will be paired. Messages will be sent to both participants to meet at a designated SMH pick-up and drop-off parking zone.

Most mobility providers have various features associated with the software platform as illustrated below (e.g., SMS and email, ability to make a payment, geographical locators, and data analysis and sharing); however, these are only for illustrative purposes. The focus of SMH is to provide the necessary infrastructure to enable safe ride-share exchanges.

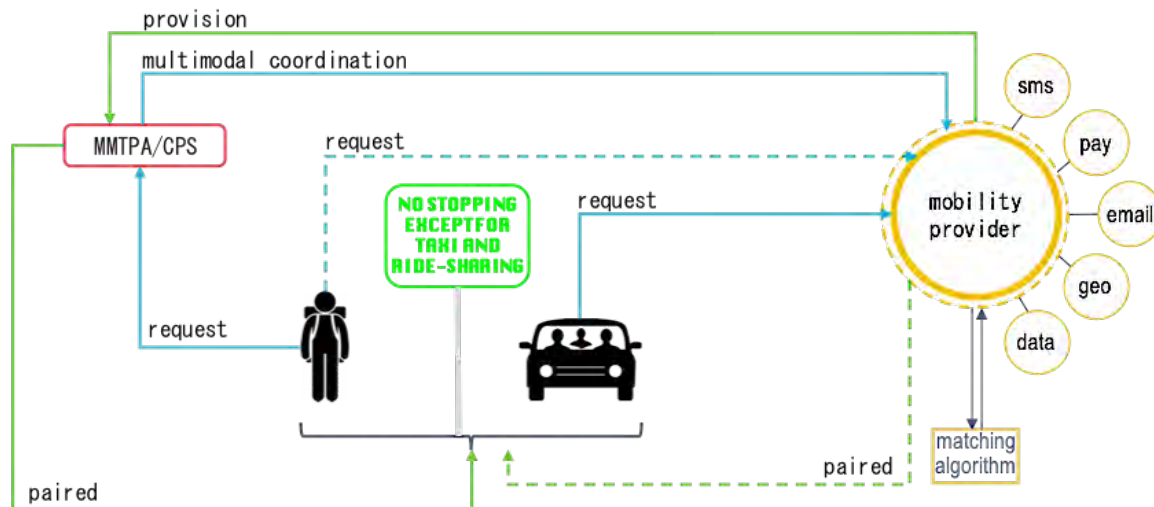


Figure 8: Generic Ride-Share System Design

Source: City of Columbus

4.2.1.1. SERVICES

- Ride-sharing enablement through the provision of parking zones for ride-share pick-up and drop-off.

4.2.1.2. USER NEEDS ADDRESSED

- Traveler: SMH-UN010-v01
- COTA: SMH-UN013-v01
- Mobility Providers: SMH-UN014-v01

4.2.1.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment or network communications.

Although there are no data and message flows, SMH will leverage data collected by MMTPA from each mobility provider, which MMTPA will archive in the Operating System for meeting user needs as well as interface requirement SMH-IF2389-V01.

4.2.1.4. ENGINEERING AND CONSTRUCTION DESIGN

The hardware associated with this amenity will vary by site, as outlined in the next section. At a minimum, all parking zones shall implement white thermoplastic pavement markings and flat sheet signage.

4.2.1.4.1 Design Structure

- Governing Building Code – International Building Code (IBC) 2015 Edition
- Concrete work for all SMH sites shall conform to “Specifications for Structural Concrete for Buildings” (ACI 301 Latest Edition). Hot and cold weather shall be in conformance with ACI 305 and ACI 306 respectively.

4.2.1.4.2 Materials

The contractor shall submit all required materials for approval to the City of Columbus, Division of Design and Construction, to the construction engineer located at 1800 E. 17th Avenue, Columbus, OH 43219.

4.2.1.4.3 Requirements Traceability

Hardware design as outlined above meets the following requirements established in the SyRS:

- SMH-FN2388-V02
- SMH-RG2393-V01

4.2.2. Car-Share

Car-share is a vehicle sharing service that provides 24/7 access to vehicles when a membership is acquired through the vehicle owning mobility provider. This transportation option offers travelers a convenient way to make connections beyond the first and last mile of a public transit stop, particularly when traveling medium to long trips. Car-share is also a great alternative to owning a vehicle.

The SMH project will enable car-share for travelers by providing designated parking spaces located away from travel lanes that allow the safe transfer of passengers from a car-share trip. These zones will primarily be used for mobility providers and will be clearly marked with signage and pavement markings.

Similar to ride-sharing, a traveler submits a car-share request to the mobility provider through an online service (this can be accomplished through the MMTPA/CPS or alternatively travelers can book directly with the mobility provider) from any Wi-Fi enabled or cellular device. If booked through the MMTPA, the app will provide the necessary coordination with the mobility provider to book a vehicle. The mobility provider will assign a vehicle to the booking event and send the authorization codes necessary to the traveler's membership access device (typically these are swipe cards that open the vehicle). Travelers are typically charged according to how long they use the cars or how far they drive. Fees cover car insurance, parking, emergency roadside service, and other car-related expenses.

4.2.2.1. SERVICES

- Car-share enablement through the provision of parking zones for vehicle drop-off.

4.2.2.2. USER NEEDS ADDRESSED

- Traveler: SMH-UN010-v01
- Mobility Providers: SMH-UN014-v01

4.2.2.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment, or network communications.

Although there are no data and message flows, SMH will leverage data collected by MMTPA from each mobility provider, which MMTPA will archive in the Operating System for meeting user needs as well as interface requirement SMH-FN3057-V01.

4.2.2.4. ENGINEERING AND CONSTRUCTION DESIGN

The hardware associated with this amenity will vary by site, as outlined in the next section. At a minimum, all parking zones shall implement white thermoplastic pavement markings and flat sheet signage.

4.2.2.4.1 Design Structure

- Governing Building Code – International Building Code (IBC) 2015 Edition
- Concrete work for all SMH sites shall conform to “Specifications for Structural Concrete for Buildings” (ACI 301 Latest Edition). Hot and cold weather shall be in conformance with ACI 305 and ACI 306 respectively.

4.2.2.4.2 Materials

The contractor shall submit all required materials for approval to the City of Columbus, Division of Design and Construction, to the construction engineer located at 1800 E. 17th Avenue, Columbus, OH 43219.

4.2.2.4.3 Requirements Traceability

Hardware design as outlined above meets the following requirements established in the SyRS:

- SMH-FN2310-V02
- SMH-LC2458-V02

4.2.3. Dockless Parking

The City of Columbus encourages the use of scooters, e-bikes, and other micromobility transportation options offered by mobility providers. These services were strategically designed with the vision that new and existing travelers would have several mobility options with seamless and efficient mode changes. Travelers will be able to continue a trip by renting a dockless bicycle, scooter, or e-bike at one location and end the trip anywhere they choose.

Devices are typically GPS-enabled with integrated locks. To reserve a device, travelers can use the kiosk or a personal wireless device to book via the MMTPA (or book directly through the mobility provider’s app or website). Bikes and scooters can be parked anywhere within the predetermined SMH service area.

To enable this capability, SMH sites will include designated zones for parking dockless devices.

4.2.3.1. SERVICES

- Micromobility transportation enablement through the provision of dockless parking zones for device (scooters, e-bikes, dockless bicycles) drop-off.

4.2.3.2. USER NEEDS ADDRESSED

- City of Columbus: SMH-UN001-v01
- Traveler: SMH-UN005-v01, SMH-UN006-v01, SMH-UN010-v01
- COTA: SMH-UN013-v01
- Mobility Providers: SMH-UN014-v01

4.2.3.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment, network communications, or data and message flows.

Although there are no data and message flows, SMH will leverage data collected by MMTPA from each mobility provider, which MMTPA will archive in the Operating System for meeting user needs as well as interface requirement SMH-FN-V01.

4.2.3.4. ENGINEERING AND CONSTRUCTION DESIGN

The hardware associated with this amenity will vary by site, as outlined in the next section. At a minimum, all parking zones shall implement white thermoplastic pavement markings and flat sheet signage.

4.2.3.4.1 Design Structure

- Governing Building Code – International Building Code (IBC) 2015 Edition
- Concrete work for all SMH sites shall conform to “Specifications for Structural Concrete for Buildings” (ACI 301 Latest Edition). Hot and cold weather shall be in conformance with ACI 305 and ACI 306 respectively.
- The dockless parking zone shall not be laid out in a manner which impedes the flow of vehicle or pedestrian traffic.

4.2.3.4.2 Materials

The contractor shall submit all required materials for approval to the City of Columbus, Division of Design and Construction, to the construction engineer located at 1800 E. 17th Avenue, Columbus, OH 43219.

4.2.3.4.3 Requirements Traceability

Hardware design as outlined above meets the following requirements established in the SyRS:

- SMH-FN2443-V01
- SMH-PR2450-V02
- SMH-LC2445-V02

4.2.4. Park and Ride

Designated park and ride parking spaces will be available at select SMH locations to allow a traveler the option to complete a segment of his or her trip using a personal vehicle. Parking at a SMH facility allows utilization of the SMH amenities to continue his or her trip using alternate modes of transportation.

All park and ride amenities are pre-existing. The SMH will enable this feature by providing the appropriate signage to inform travelers of this feature. At the time of this project, park and ride lots do not have instrumentation and no data is expected to be collected by the project.

4.2.4.1. SERVICES

- Enablement of park and ride features and traveler adoption through signage communications.

4.2.4.2. USER NEEDS ADDRESSED

- City of Columbus: SMH-UN002-V01
- Traveler: SMH-UN005-V01

4.2.4.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment, network communications, or data and message flows.

4.2.4.4. ENGINEERING AND CONSTRUCTION DESIGN

The SMH project will leverage the already existing park and ride infrastructure. There is no planned engineering or construction as part of this amenity apart from the flat sheet signage.

4.2.5. Bike-Share

Bike-sharing services are a transportation service designed to provide travelers with a convenient way to make short trips along the corridor. Amenities associated with this service include bike rentals, privately operated bike-share docking stations, and the back-end software system. Industry standards for the bike-share amenity are similar to that of an average personal bicycle (see 16 CFR 1512 and ISO 4210-2:2015 standards); however, the bike will have a more robust frame designed to withstand Columbus' harsh outdoor weather conditions in all seasons and heavy utilization. It is expected the bike-share bike will contain commercial-grade parts, such as puncture resistant tires, chainless shaft, and proprietary anti-theft mechanisms to protect against vandals. For safety, the bicycles should come with a front light and a wireless tracking system, such as radio-frequency identification devices (RFIDs) used to locate a bicycle and determine where it is picked up and returned. For rideability, the bicycles should have an adjustable seat and provide good control, balance, be accessible to most sizes, accommodate various heights and weights, as well as skill levels. They are designed to ride well along the corridor and within the city, but are not designed to be used for mountain, track, BMX, etc., type use. Bike-share stations are fully automated, solar powered, and provide a locking mechanism that allows travelers to check bicycles easily in or out of designated stations.

These services were strategically designed along with the vision that new and existing travelers would have several safe mobility options with seamless and efficient mode changes.

4.2.5.1. SERVICES

- Bike-Share Docking Station

4.2.5.2. USER NEEDS ADDRESSED

- City of Columbus: SMH-UN001-v01
- Traveler: SMH-UN005-v01, SMH-UN010-v01
- COTA: SMH-UN013-v01
- Mobility Providers: SMH-UN014-v01

4.2.5.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment or network communications.

Although there are no data and message flows for this amenity in the context of SMH, the project will leverage data collected by MMTPA from each mobility provider, which MMTPA archives in the Operating System for meeting user needs as well as requirements associated with data collection and system availability reporting as follows: SMH-FN2294-V02, SMH-FN2297-V01, SMH-FN2298-V01, SMH-DR2283-V02, SMH-DR2284-V02, SMH-DR2285-V02, SMH-DR2286-V02, and SMH-AR2282-V01.

4.2.5.4. ENGINEERING AND CONSTRUCTION DESIGN

The hardware associated with this amenity will vary by site, as outlined in the next section. At a minimum, all parking zones shall implement white thermoplastic pavement markings and flat sheet signage.

4.2.5.4.1 Design Structure

- Governing Building Code – International Building Code (IBC) 2015 Edition
- Concrete work for all SMH sites shall conform to “Specifications for Structural Concrete for Buildings” (ACI 301 Latest Edition). Hot and cold weather shall be in conformance with ACI 305 and ACI 306 respectively.
- The docking stations shall be primarily located within the public right-of-way, along public streets and sidewalks, parks, trails, parking lots/garages, events venues, etc., or be located on private property, provided that the property owner agrees to allow 24/7 public access to the docking station.
- The bike-share docking station shall not impede flow of vehicle or pedestrian traffic.
- At a minimum, bicycles meet the minimum standards set forth in 16 CFR 1512 and ISO 4210-2:2015, which outlines basic safety and performance requirements for the design, assembly, and testing of bicycles and subassemblies.
- City of Columbus will work with dockless vendor to establish a process for minimum number of devices per SMH facility flexible for expansion after project is launched and travel patterns/trends are measured.

4.2.5.4.2 Materials

The contractor shall submit all required materials for approval to the City of Columbus, Division of Design and Construction, to the construction engineer located at 1800 E. 17th Avenue, Columbus, OH 43219.

4.2.5.4.3 Requirements Traceability

Hardware design as outlined above meets the following requirements established in the SyRS:

- SMH-PR2301-V02
- SMH-RG2303-V02
- SMH-RG2461-V02
- SMH-FN2290-V02

4.2.6. Bike Racks

Stationary bike racks are a common short-term bike parking option offered at select SMH facilities. Typically, there is no fee associated for bicycle parking. This feature can be used in areas with limited sidewalk space to make use of on-street areas that are unsuitable for auto parking.

4.2.6.1. SERVICES

- Bicycle parking

4.2.6.2. USER NEEDS ADDRESSED

- Traveler: SMH-UN011-v01

4.2.6.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment, network communications, or data and message flows.

4.2.6.4. ENGINEERING AND CONSTRUCTION DESIGN

Bicycle rack frames are typically U-shaped and are constructed of multiple galvanized posts, which hold two or more bikes per frame and flat sheet signage.

4.2.6.4.1 Design Structure

- Governing Building Code – International Building Code (IBC) 2015 Edition
- Concrete work for all SMH sites shall conform to “Specifications for Structural Concrete for Buildings” (ACI 301 Latest Edition). Hot and cold weather shall be in conformance with ACI 305 and ACI 306 respectively.
- The placement of bike racks shall not impede flow of vehicle or pedestrian traffic.
- Bike racks should be modular in construction so that additional racks may be installed in the future with similar overall functional and aesthetic qualities.

4.2.6.4.2 Materials

All bike racks in this project are existing and therefore additional materials will not be added at this time.

4.2.6.4.3 Requirements Traceability

Hardware design as outlined above meets the following requirements established in the SyRS:

- SMH-PR2275-V01
- SMH-RG2276-V01
- SMH-LC2456-V01

4.2.7. Automated Vehicle Shuttles

City of Columbus is currently planning on enabling pick-up and drop-off transportation using automated vehicle (AV) shuttles at the Linden Transit Center and the St. Stephen's Community House facilities, which provides a transportation link to bus rapid transit that services downtown and employment centers. Although the stations are externally deployed through a separate project, they are classified as an amenity, since the feature is a mobility transportation service in the SMH service and scope area. Additional information surrounding the AV shuttle system design will be included in the CEAV project documentation.

4.2.7.1. SERVICES

- AV Shuttle Service

4.2.7.2. USER NEEDS ADDRESSED

- Traveler: SMH-UN005-V01, SMH-UN006-V01, SMH-UN010-V01

4.2.7.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment, network communications, or data and message flows. These system components will be contained in the CEAV documentation.

4.2.7.4. ENGINEERING AND CONSTRUCTION DESIGN

The AV Shuttle project will be designing and installing all necessary signage and other materials for this community amenity.

4.2.8. Electric Vehicle Charging Station

City of Columbus is currently planning on deploying electric vehicle charging stations (EVCS) at select SMH facilities. This amenity will be strategically integrated to provide access to electric vehicle supply equipment used to charge hybrid and all-electric vehicles. COTA currently operates the park and ride lots and soon, through local American Electric Power (AEP) grants, will assist in the management of EV charging stations. Although the stations are externally deployed through a separate project, they are classified as a future-state amenity in reference to the SMH context. A new car-share provider in the City of Columbus will be installing EV charging stations for its fleet and public use at the Columbus State Community College location.

4.2.8.1. SERVICES

- EV charging for electric vehicles

4.2.8.2. USER NEEDS ADDRESSED

- City of Columbus: SMH-UN001-V01, SMH-UN002-V01
- Traveler: SMH-UN005-V01, SMH-UN006-V01, SMH-UN010-V01

4.2.8.3. SYSTEM COMPONENTS

In the context of the SMH project, there are no software-related system components associated with this SMH amenity and therefore no IT hardware equipment, network communications or data and message

flows. These system components will be contained in the documentation for the Paul G. Allen Foundation Electrification Project simultaneously being deployed in Columbus.

4.2.8.4. ENGINEERING AND CONSTRUCTION DESIGN

The Paul G. Allen Foundation Electrification Project will be designing and installing all necessary signage, infrastructure, and other materials for this community amenity.

Chapter 5. Mobility Hubs

Each amenity offered at SMH project sites (detailed in **Chapter 4**) was mindfully considered and designed to address service gaps identified in the Columbus area, as outlined in the ConOps (lack of centralized physical facilities offering accessible trip planning and multimodal transit options, limited FMLM transportation options, trips not being optimized for ride-sharing, etc).

The geographic service area of the SMH facilities where amenities will be deployed extends over the Cleveland Avenue corridor coinciding with COTA's bus rapid transit (BRT) service (CMAX) to the Easton commercial district. Individual SMH facilities will vary in size, configuration, and available services since the goal of the sites is to incorporate the amenities within the existing physical constraints.

Figure 9 provides a high-level overview of the SMH project scope area along the Cleveland corridor.

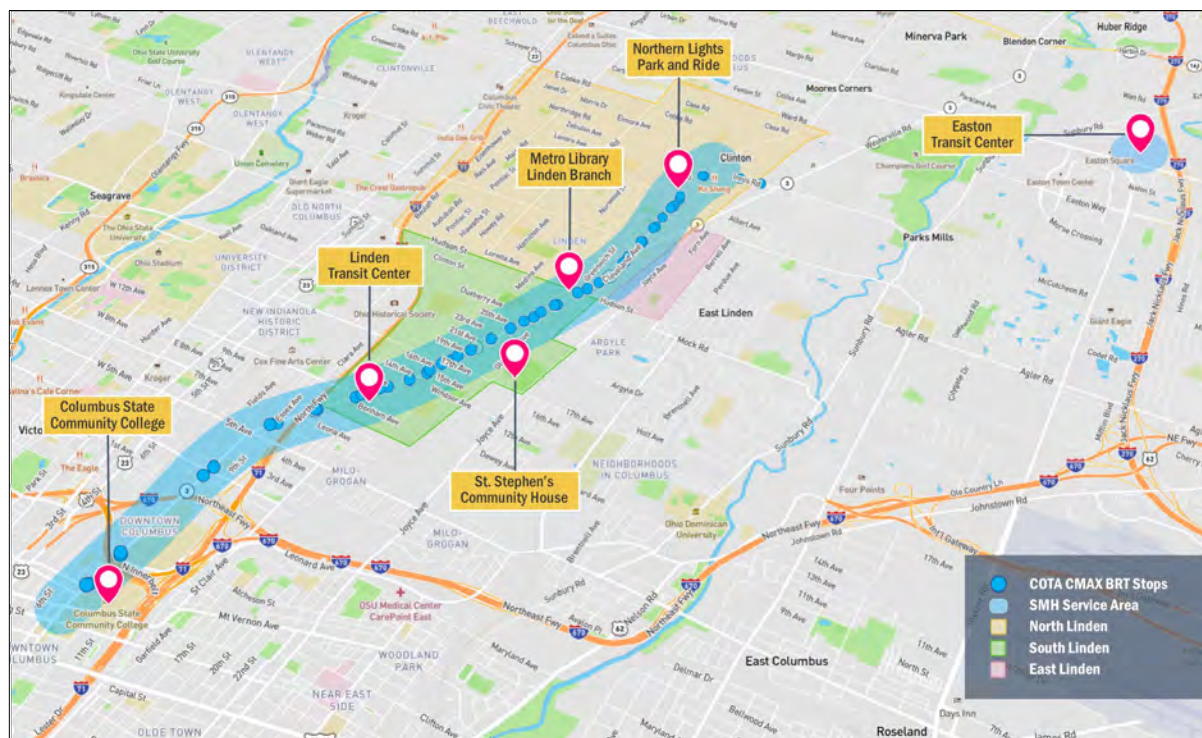


Figure 9: Project Scope Area Along Cleveland Corridor

Source: City of Columbus

The ensuing sections provide site specific descriptions and proposed design details, with a list of components to be implemented at each SMH facility. In addition to amenities, property owners may add other enhancements such as improved waiting areas with landscaping and lighting. The facilities are described (and will be constructed in order listed) from south traveling north.

5.1. COLUMBUS STATE COMMUNITY COLLEGE

The CSCC campus is located between Linden and downtown. The Cleveland Avenue corridor with CMAX service stops runs right through the central campus area. The campus occupies more than 80 acres in Columbus' Discovery District. CSCC has over 27,000 students enrolled representing over 130 countries of different backgrounds, life experiences and nationalities. This urbanized, high-foot traffic facility continues to evolve into a full-scale MaaS enabler. The CSCC location currently offers Wi-Fi internet access, bike-sharing, bike racks, and real-time displays adjacent to CMAX BRT stations. The SMH will offer an interactive kiosk with complimentary Wi-Fi, an emergency call button, USB charging stations, dockless device parking, electric vehicle charging, and designated car-share parking.

5.1.1. Miscellaneous Information

- Ongoing and planned growth for the CSCC campus including new buildings in direct proximity to proposed SMH location.
- Existing driveway will be closed as part of the future development of surface lot parcel. Additional ride and car-share parking will be added at that time.
- Contractor will coordinate relocation of bike-share with Columbus Recreation and Parks.
- Contractor to coordinate construction with City of Columbus Department of Public Service Roadway improvement creative campus Phase 2.
- GreenSpot car-share provider will install electric vehicle charging units for its fleet and for public use at this location. The charging locations are not shown on Figure 11 since they are being deployed by another entity and this development came after the advertisement for the installation contractor.

5.1.2. Columbus State Community College Location and Geometric Layout

550 EAST SPRING STREET, COLUMBUS, OHIO 43215

Figure 10 provides an overview of the geometric layout and planned design for the CSCC mobility hub.

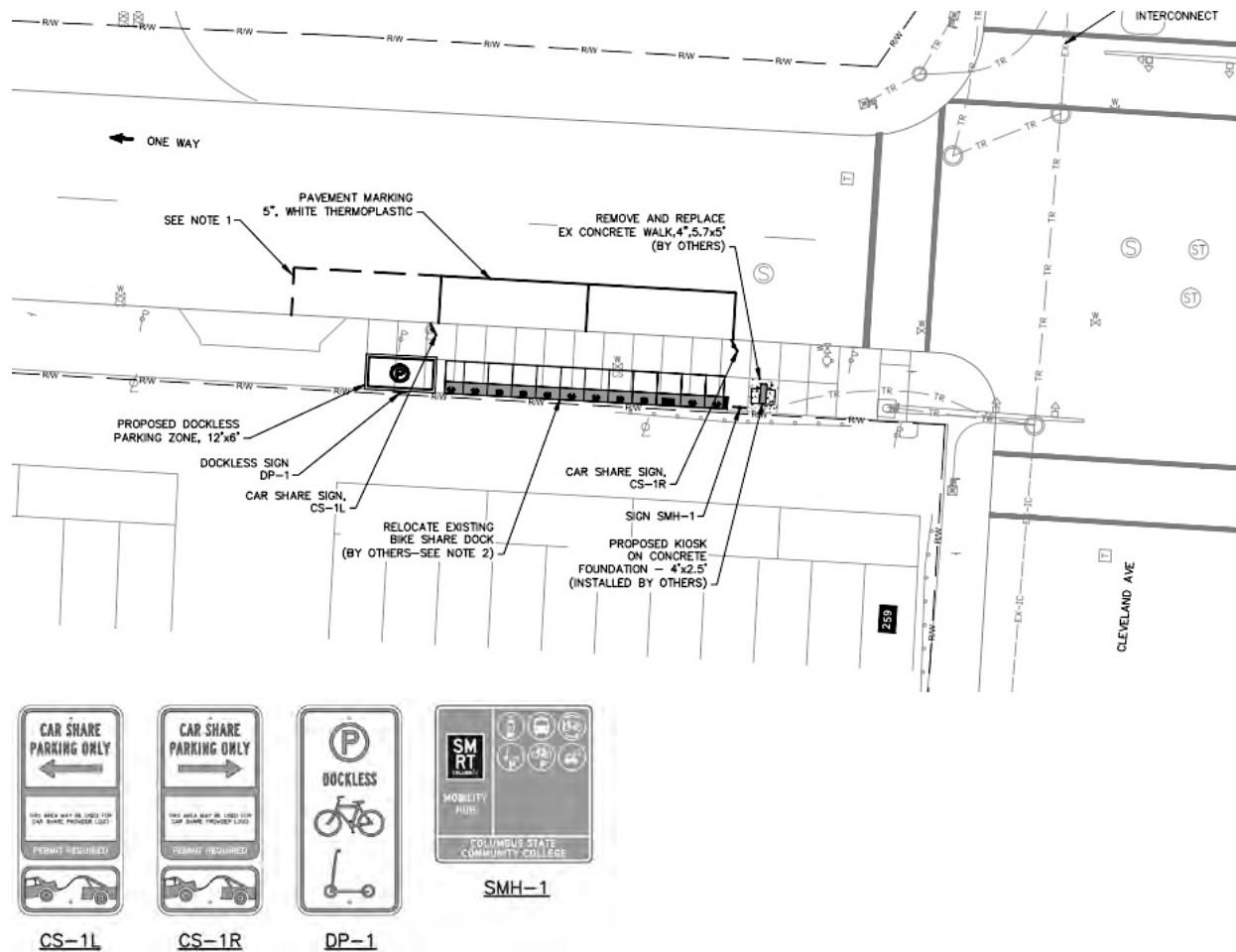


Figure 10: Planned Design for the Columbus State Community College Mobility Hub¹

Source: City of Columbus

¹ Electric Vehicle Charging Stations are being added to East Naghten Street through the Paul G. Vulcan Foundation Electrification Project. East Naghten Street is one street south of Mount Vernon Avenue.

5.2. LINDEN TRANSIT CENTER

The Linden Transit Center (LTC) is an existing COTA facility with various community services co-located within a shared business center environment with medical and academic services nearby. This SMH is equipped with complimentary Wi-Fi, real-time displays, a traveler waiting area, a parking lot, and a CMAX shelter on the curbside of the transit center. Existing amenities at this waiting area include weather protection, seating, trash receptacles, lighting, retail, and personal lockers.

Smart Columbus has partnered with COTA to enhance this facility with ride-sharing and bike-sharing services, an interactive kiosk with complimentary Wi-Fi, an emergency call button, USB charging stations, dockless device parking, and AV shuttle transportation. These services will enable more than one mode of transport and extend additional safety measures, traveler comfort, and security at the hub.

5.2.1. Miscellaneous Information

- Signal is located within COTA signal parcel #010-034599.
- Contractor will coordinate installation of bike-share docking station with Columbus Recreation and Parks.

5.2.2. Location and Geometric Layout

1380-1390 CLEVELAND AVENUE, COLUMBUS, OHIO 43211

Figure 11 provides an overview of the geometric layout and planned design for the LTC mobility hub.

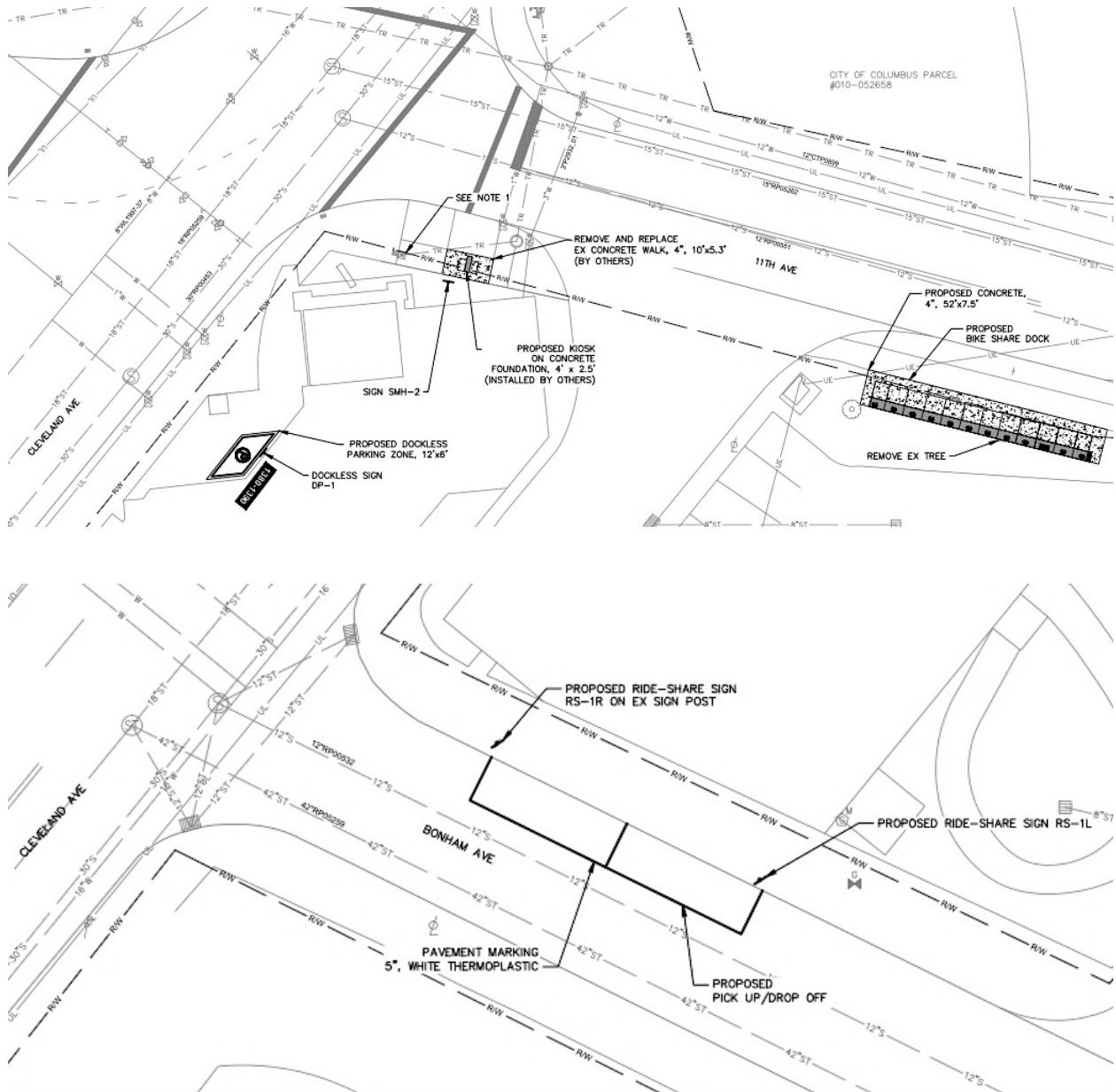


Figure 11: Planned Design for the Linden Transit Center Mobility Hub

Source: City of Columbus

5.3. ST. STEPHEN'S COMMUNITY HOUSE

St. Stephen's Community House (SSCH) is a neighborhood center in Linden that helps to build the community by providing child, family, senior, and youth social services for immigrants, the disadvantaged, and many other Ohio residents. St. Stephen's is seen as a pillar to help advance self-sufficiency in the community and currently offers bike racks for travelers on personal bicycles.

Smart Columbus has partnered with St. Stephen's Community House to enhance its facility with car-, ride-, bike-sharing services, dockless device parking, and pick-up and drop-off using an AV shuttle. In addition, the project will install a kiosk indoors to provide users with free Wi-Fi, emergency call services, and will have a USB charging station.

In addition to viewing transit information and being able to plan a trip from start to finish across multiple modes, users of this SMH will be able to search and locate community services, browse local area maps, search for job opportunities, and view city announcements.

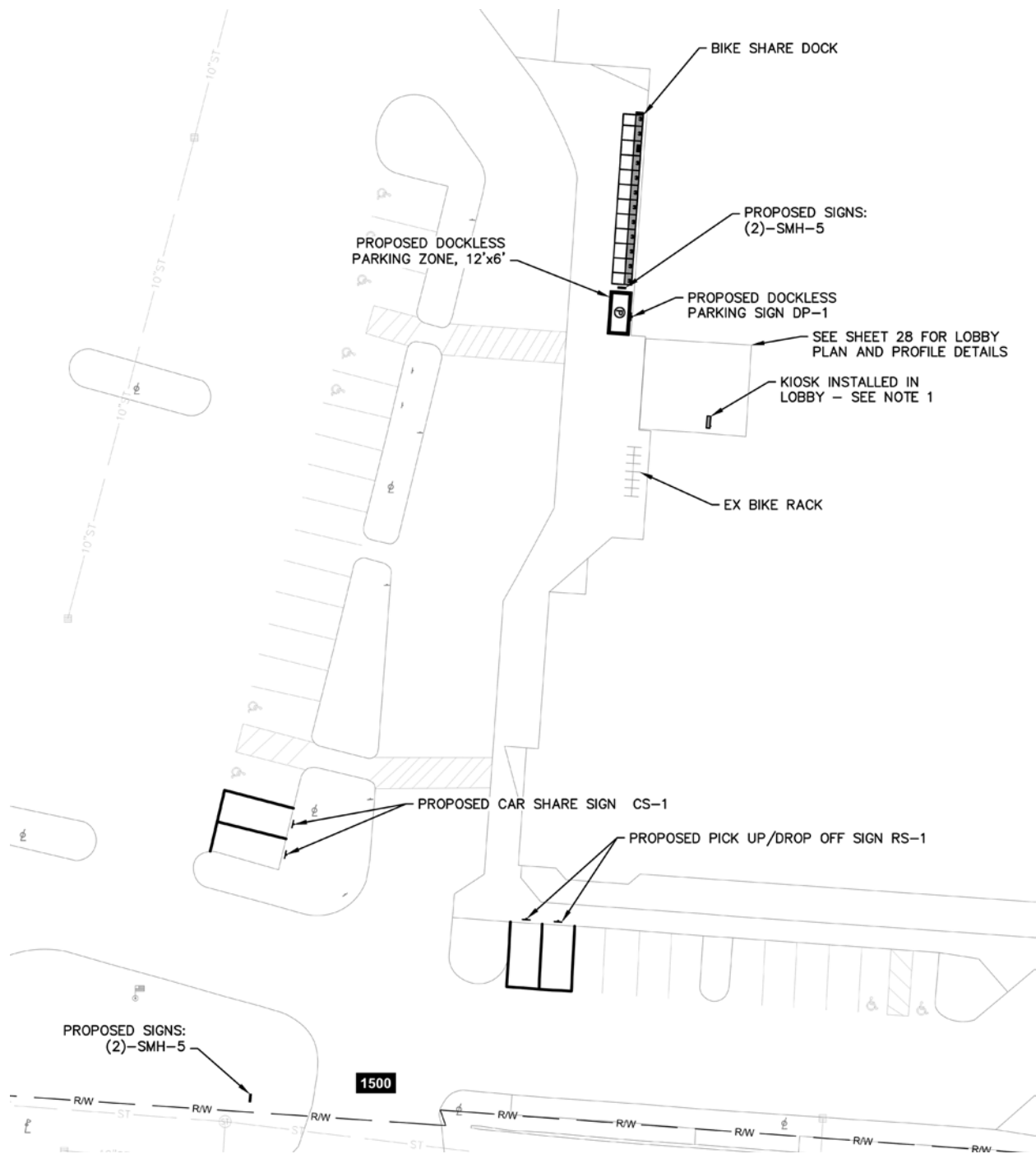
5.3.1. Miscellaneous Information

- Contractor to coordinate exact placement and power/communication connections with St. Stephen's facility manager.

5.3.2. Location and Geometric Layout

1500 E 17TH AVENUE, COLUMBUS, OHIO 43215

Figure 12 provides an overview of the geometric layout and planned design for the SSCH mobility hub.



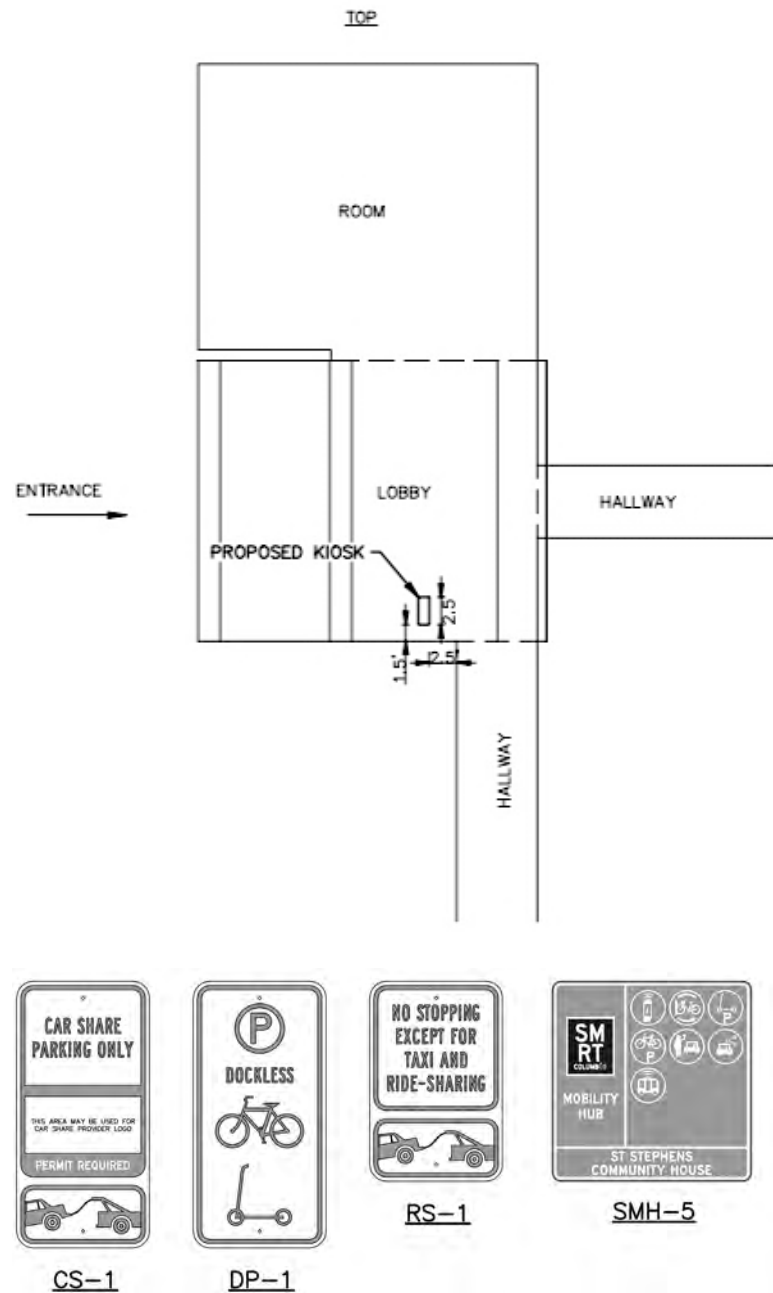


Figure 12: Planned Design for St. Stephen's Community House Mobility Hub

Source: City of Columbus

5.4. METRO LIBRARY – LINDEN BRANCH

This proposed mobility hub will be located at the Columbus Metro Library – Linden Branch (ML-LB) and is in close proximity to an existing COTA CMAX stop. This SMH is equipped with bike racks for travelers on personal bikes and has limited off-street parking spaces available for share-usage designation.

City of Columbus has partnered with the Metro Library to enhance this facility with various smart technologies including car- and bike-sharing, dockless device parking, and an interactive kiosk.

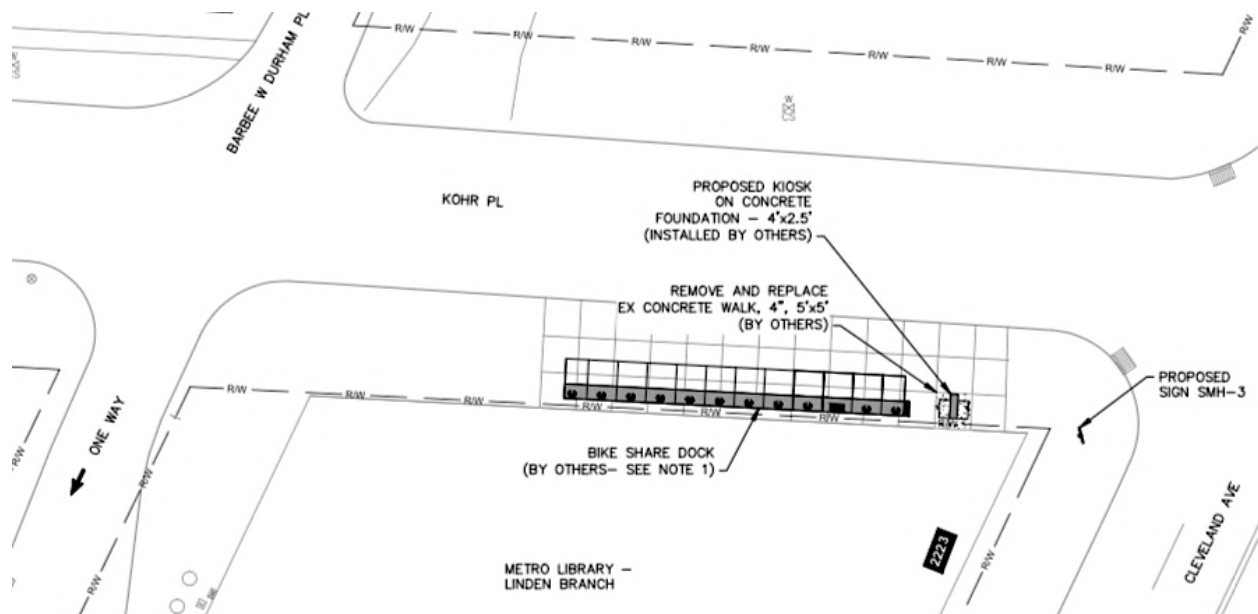
5.4.1. Miscellaneous Information

- Contractor will coordinate installation of bike-share dock with Columbus Recreation and Parks.

5.4.2. Location and Geometric Layout

3569 CLEVELAND AVENUE, COLUMBUS, OHIO 43224

Figure 13 provides an overview of the geometric layout and planned design for the ML-LB mobility hub.



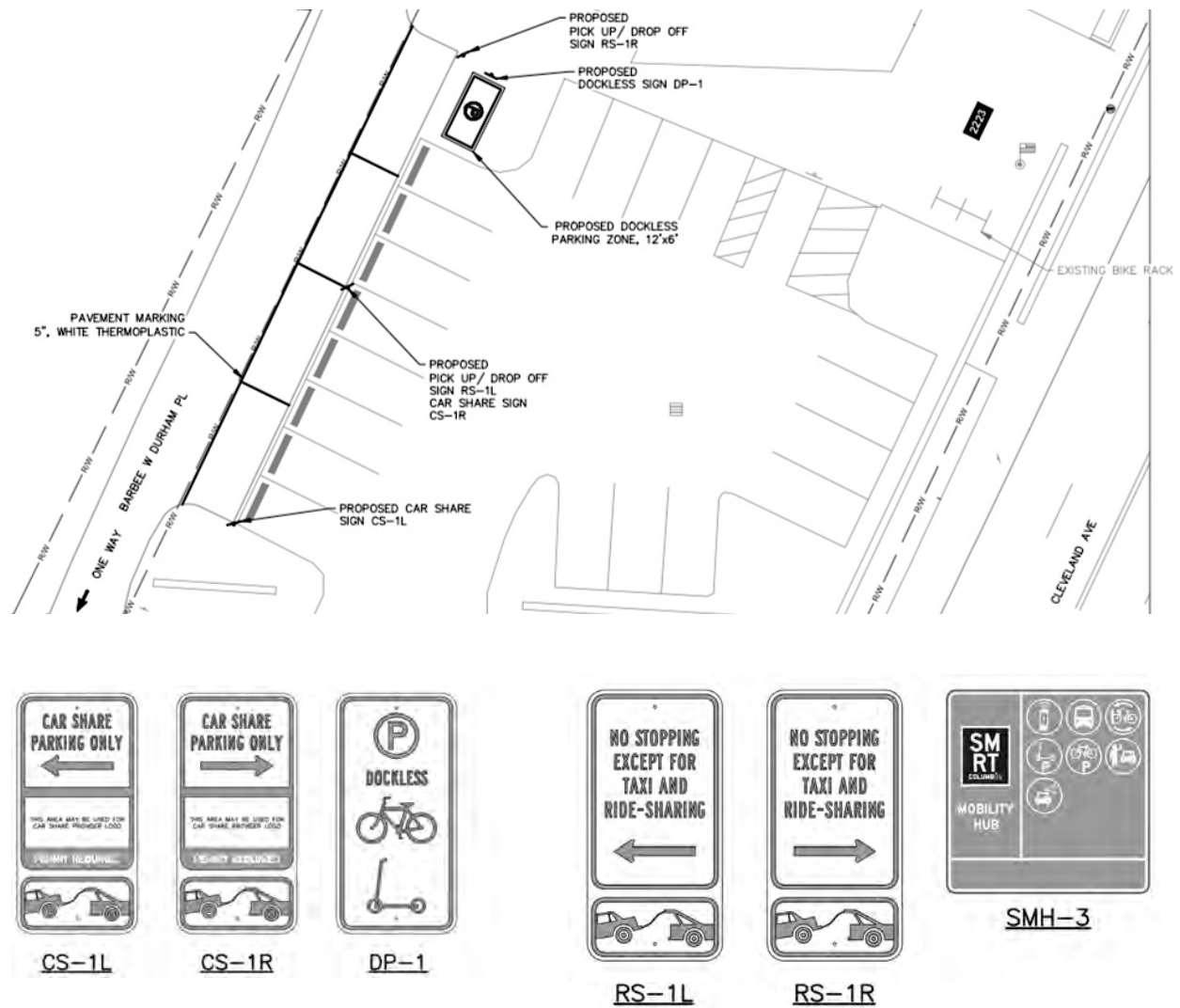


Figure 13: Planned Design for the Metro Library – Linden Branch Mobility Hub

Source: City of Columbus

5.5. NORTHERN LIGHTS PARK AND RIDE

The Northern Lights Park and Ride (NLPR) is a new facility that opened in August 2018. This SMH is equipped with 120 spaces, encouraging travelers to park for free and complete a segment of the trip by using local facility amenities and alternate modes of transportation. In addition to park and ride, the SMH offers complimentary Wi-Fi, ride-sharing services, and COTA CMAX real-time displays.

City of Columbus has partnered with COTA to enhance this outdoor facility with car-share, ride-share, dockless device parking, an interactive kiosk and USB charging stations. In addition, this facility currently has bike racks and is slated to support EV charging in the near future.

5.5.1. Miscellaneous Information

- Equipment to be located within COTA owned parcels 130-004141, 010-219215, 130-011910.

5.5.2. Location and Geometric Layout

3569 CLEVELAND AVENUE, COLUMBUS, OHIO 43224

Figure 14 provides an overview of the geometric layout and planned design for the NLPR mobility hub.

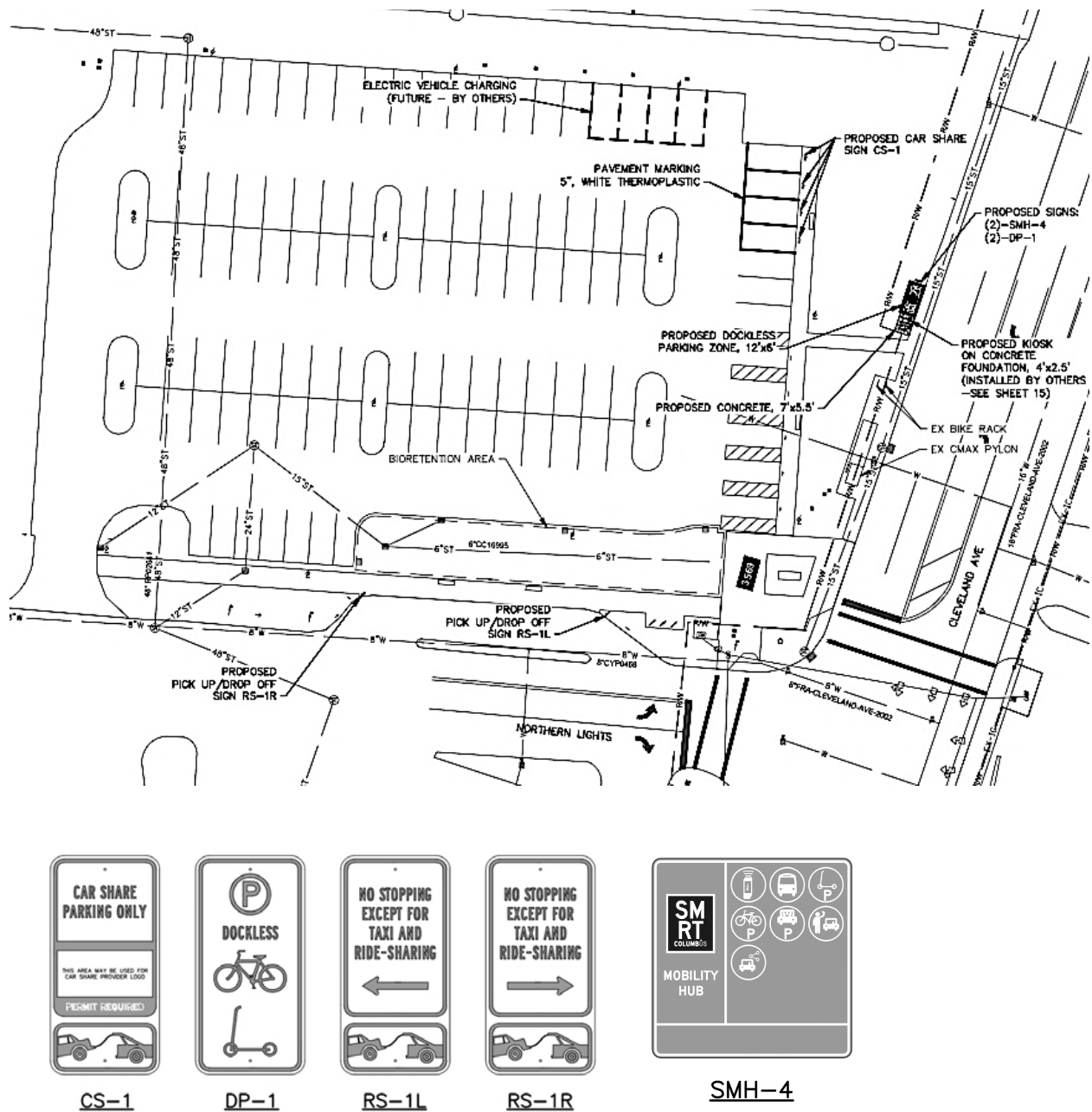


Figure 14: Planned Design for the Northern Lights Park and Ride Mobility Hub

Source: City of Columbus

5.6. EASTON TRANSIT CENTER

The Easton Transit Center (ETC) is a state-of-the-art transportation hub near Easton Town Center. The facility includes an 8,950 square-foot overhead canopy, and nine bus bays with three layover bays. The building was expanded in 2017 to accommodate increased service levels. The facility also includes an adjacent daycare center operated by an independent provider, leasing the space from COTA. This outdoor facility is currently equipped with a park and ride, bike racks, Wi-Fi, and real-time displays.

City of Columbus has partnered with COTA to enhance this facility with an interactive kiosk, USB charging stations, bike-share, ride-share, and an emergency call button.

5.6.1. Location and Geometric Layout

4260 STELZER ROAD, COLUMBUS, OHIO 43230

Figure 15 provides an overview of the geometric layout and planned design for the ETC mobility hub.

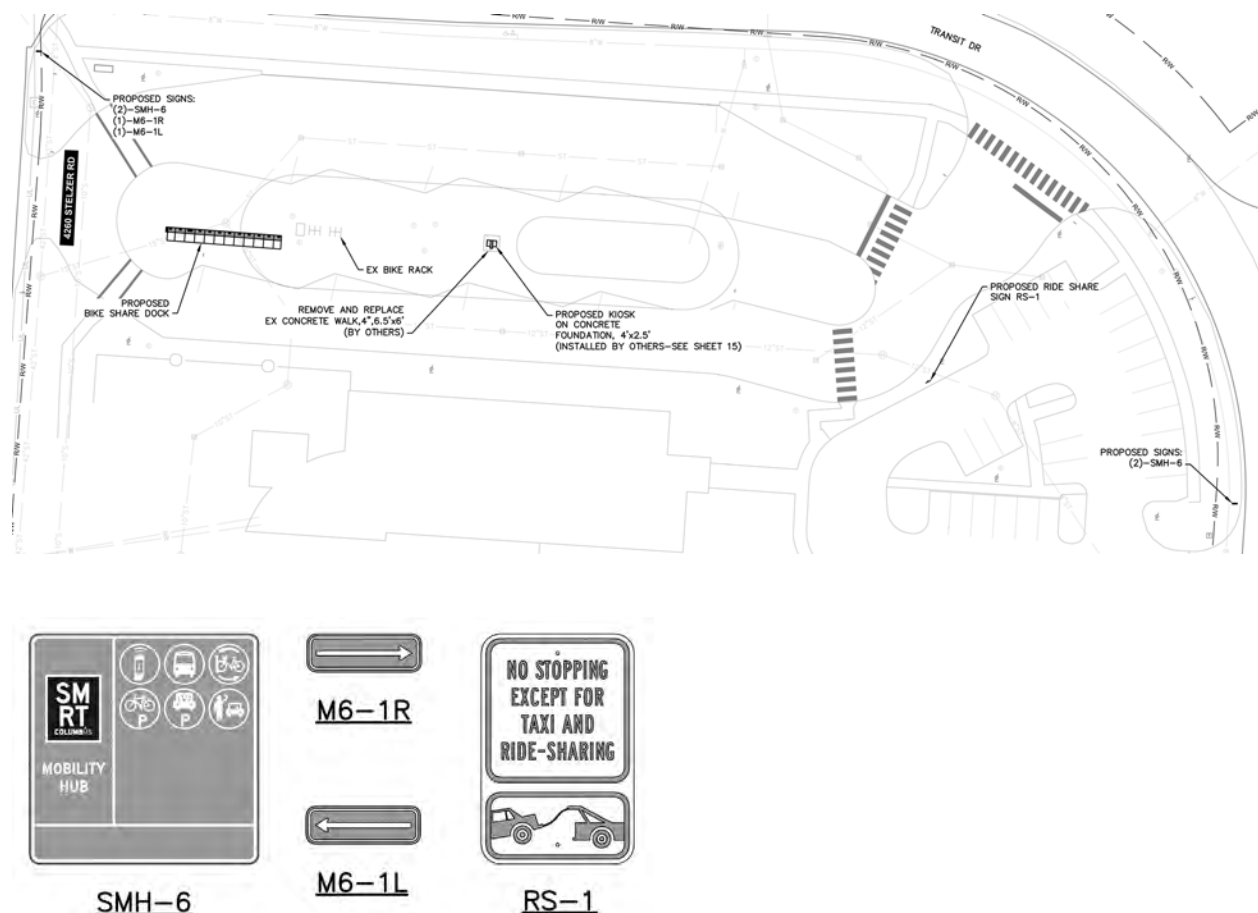


Figure 15: Planned Design for the Easton Transit Center Mobility Hub

Source: City of Columbus

Chapter 6. Design Rationale

This section will detail the design rationale for the amenities at the Smart Mobility Hubs.

6.1. BIKE-SHARE DOCKING STATION

- Not deemed practical unless another bike-share docking station installed within one mile of proposed site; this conclusion resulted in this amenity not being proposed for the Northern Lights Park SMH site at this time.
- E-bikes may be piloted with this deployment, though the stations will not charge the bikes and batteries will be swapped by bike-share vendor.
- Solar interference at library leading to hardwiring docking station.

6.2. USB CHARGING

- Additional pedestal independent of IK preferred option due to security and environmental concerns from IK vendor.
- Not proposed for Metro Library – Linden Branch SMH site due to ongoing concerns with after-hour loitering on library campus.

6.3. CAR-SHARE, PARK AND RIDE

- These amenities require that parking spaces are available at the SMH facility for designation of the respective service. SMH sites such as Easton Transit Center do not have available parking space in proximity to the SMH for car-share and therefore will not be included with the initial deployment.

6.4. EMERGENCY CALL BUTTON

- ECB will be included as part of the IK deployment and will be integrated with the IK itself. Provisions in the SMH design will identify the orientation of the IK so that the call button will be facing the higher traffic areas of the SMH site and accessible to travelers.

6.5. SIGNAGE

- Additional signage will be provided for SMH sites where services are located away from primary access road.
- SMH sign design will allow quick and easy modification as additional SMH services are included as well as allow for future modal expansions that currently do not operate in Columbus.

6.6. ACCESSIBILITY

- Preferred layout includes locating dockless device parking zones near entryways of buildings or heavy-traffic areas.

- Placement of amenities depended largely on maintaining pedestrian access clearance, right-of-way, and existing signal and utility infrastructure.

6.7. INTERACTIVE KIOSK

- Provided by vendor, which has existing contract with City of Columbus for deployment of numerous sites within the City and adjacent to the SMH project area. The SMH project team deemed this to be an important consideration to maintain a consistent and uniform interface for SMH users. Additionally, this will allow for quick expansion of SMH functions to additional sites throughout the City.

6.8. ELECTRIC VEHICLE CHARGING

- Since EVC is being developed as part of a concurrent City program it was generally not included within the design parameters of the SMH project design. COTA has made provisions for EVC by installing infrastructure at the Northern Lights Park and Ride facility and the SMH design has considered some of these aspects by identifying this service as future work to be installed by separate projects. A new car-share company in Columbus, Greenspot, will be installing EV charging at the CSCC location as part of the car-share program.

Chapter 7. Summary of Conclusions

7.1. PROJECT OBJECTIVES REVIEW

The following provides a review of the SMH project objectives and how the SMH design plans to meet the objectives established through the ConOps.

7.1.1. Mobility Objective

Table 16: SMH Mobility Objective

Category	Description	
Objective	Improve physical access to multimodal trip planning and payment options.	
Target Outcome(s)	SMHs facilitate multimodal trips by allowing travelers to use kiosks and Wi-Fi to access the MMTPA/CPS application and by consolidating multiple modes of transportation at a single location.	
Measurement Metrics	Number of trip planning requests/bookings at SMH (via kiosk/mobile device, enabled by kiosk Wi-Fi)	Application usage (MMTPA/CPS: number of multimodal trips, number of multimodal trips planned at a kiosk)
Measurement Method	Post-only trend analysis	Post-only trend analysis
Data Source(s)	All data will be available for access from the Operating System. MMTPA and CPS applications will send the trip planning and booking data to the Operating System.	
Timeframe	One-year post-implementation	

Source: City of Columbus

7.1.2. Customer Satisfaction Objective

Table 17: SMH Customer Satisfaction Objective

Category	Description
Objective	Improve customer satisfaction of SMH users
Target Outcome(s)	SMH facilities with easy and convenient access to enhanced trip planning, multimodal options, Wi-Fi-access, and emergency call button will improve customer satisfaction.
Measurement Metrics	Customer satisfaction (ease of kiosk use, usefulness, accessibility)
Measurement Method	Post-only trend analysis
Data Source(s)	Customer survey

Category	Description
Timeframe	One-year post to implementation

Source: City of Columbus

7.2. FUTURE PROJECT ENHANCEMENTS

As electric vehicle use continues to rise, the SMH project will seek to add electric vehicle charging to the locations where it could benefit the residents or users of that property. In conjunction with each property owner, the team will review space requirements, electrical infrastructure availability, and use cases for each property prior to moving forward on this amenity.

Appendix A. Traceability Matrix

Table 18 shows reverse traceability, validating design components toward system requirements, established from user needs, with defined interfaces, as outlined by the major steps of the system engineering process. All linked relations and attributes listed in the matrix below pivot around the requirement. For instance, for each requirement row, there may be one or more user needs, one or more interfaces, one or more sections in the SDD – all relate (and are traced back) to the requirement listed within that row.

Table 18: Traceability Matrix

SMH Amenity	Requirement Identifier	Requirement Description	User Need Identifier	User Need Reference	Interface Identifier	Interface Source (S) and Destination (D)	Constraint Identifier	Constraint Description	SDD Section	Design Component
Bike Racks	SMH-AR2274-V02	The number of bike racks per SMH location should be equal to 5% of the total number of parking spaces.	SMH-UN011-v01	Bike Racks	–	–	–	–	5.3.1	Geometric layout per facility with bike rack amenity.
Bike-Share	SMH-AR2282-V01	The docking station shall be designed for persistent always-on availability, maintaining continuous operation 24 hours a day, 7 days a week, 365 days a year.	SMH-UN011-v01	Bike Racks	–	–	–	–	4.2.5.3	Data collected by the MMTPA will be made available to SMH via the Operating System data utilization component (human interface). This will be used to ensure operability, service uptime, and trends in transportation.
Emergency Call Button	SMH-AR2318-V01	The ECB service shall be made available 24 hours a day, 7 days a week, 365 days a year.	SMH-UN007-v01	Emergency Call Button	SMH-IX2433-V01	(S) Emergency Call Button on the Kiosk (D) Emergency Call Center	–	–	4.1.2.4 4.1.2.5	The ECB will use the kiosk’s network and communications interface

			SMH-UN015-v01	Emergency Call Button Integration	SMH-IX2434-V01	(S) Emergency Call Center (D) Kiosk				for 24x7x365 service availability
Interactive Kiosk	SMH-AR2326-V02	The IK System shall incorporate system redundancies to the extent practical to guard against failure of individual hardware, software, network, or communications components and ensure maximum, persistent always-on availability, maintaining continuous operation outside of the scheduled maintenance 24 hours a day, 7 days a week, 365 days a year.	SMH-UN003-v01	User Interface Device	–	–	–	–	2.4 4.1.1.3 4.1.2.3 4.1.3.3	The City will leverage its operations and maintenance agreement with the kiosk vendor to establish and measure service level agreements (SLA) unique to each kiosk subsystem (e.g., kiosk display, Wi-Fi, emergency call button, etc.)
			SMH-UN004-v01	Public Wi-Fi						
			SMH-UN006-v01	Real-Time Information						
			SMH-UN007-v01	Emergency Call Button						
			SMH-UN008-v01	IVR						
			SMH-UN010-v01	Educational Information						
			SMH-UN014-v01	Mobility Provider Infrastructure						
Wi-Fi Enabled	SMH-AR2399-V01	The Wi-Fi network shall be fault tolerant and maintain continuous network uptime outside of the scheduled maintenance, 24-hour per day, 365-day per year.	SMH-UN004-v01	Public Wi-Fi	–	–	–	–	2.4 4.1.3	The City will leverage its operations and maintenance agreement with the kiosk vendor to establish and measure service level agreements (SLA) unique to each kiosk subsystem (e.g., kiosk display, Wi-Fi,

										emergency call button, etc.)
Interactive Kiosk	SMH-DP2327-V01	Replacement and disposal of damaged parts on IK shall be performed by vendor.	SMH-UN003-v01	User Interface Device	–	–	–	–	2.4	The City will leverage its operations and maintenance agreement with the kiosk vendor to execute part replacements for the IK.
Bike-Share	SMH-DR2284-V01	The bike-share company shall maintain and share a list of deployed bikes, listed by unique identifier with the City monthly.	SMH-UN001-v01	Data Collection	–	–	–	–	4.2.5.3	Data collected by the MMTPA will be made available to SMH via the Operating System data utilization component (human interface).
Bike-Share	SMH-DR2285-V01	The bike-share company shall maintain and share a list of lost, stolen, and vandalized bikes with the City monthly.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.2.5.3	As part of the service agreement, mobility providers are expected to report monthly on any equipment that is lost, stolen, or vandalized. This data (device ID, status, etc.) will be updated within the MMTPA database in order to maintain current, correct, and complete information on devices and their availability. Updated information will be made available to SMH via the Operating System.
Bike-Share	SMH-DR2286-V01	The bike-share company shall maintain and share a record of maintenance activities	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	5.1 5.2 5.3 5.4	Travelers will access bike-share amenities at participating facilities:

		including but not limited to identification number and maintenance performed with the City monthly.							5.6.1	CSCC, LTC, SSCH, MT-LB, ETC
Emergency Call Button	SMH-DR2320-V01	ECB shall record the time, date, and location upon activation.	SMH-UN007-v01	Emergency Call Button	–	–	–	–	4.1.2.3 4.1.2.4 4.1.2.6	City of Columbus will be deploying a turn-key product equipped with audio and video. Upon activation, the metadata associated with an incident is captured.
			SMH-UN015-v01	Emergency Call Button Integration						
Emergency Call Button	SMH-DR2321-V02	The street address and GPS coordinates of the SMH facility shall be sent to the ECC to notify dispatchers of location of the help request.	SMH-UN007-v01	Emergency Call Button	SMH-IX2433-V01	(S) Emergency Call Button (D) Emergency Call Center	–	–	4.1.2.3	Table 9 details the components specific to the ECB system, detailing the out-of-the-box features that will be leveraged to meet the requirement and provides traceability from row to SyRS requirement.
			SMH-UN015-v01	Emergency Call Button Integration						
Interactive Kiosk	SMH-DR2328-V01	The IK touchscreen interface shall allow Travelers to access data contained in the Operating System through the MMTPA application such as schedule information, static service information (e.g. fares), trip planning information, real-time service information,	SMH-UN001-v01	Data Collection	–	–	–	–	4.1 4.1.1	The IK is a self-service solution that will connect to various data sources that directly or indirectly access data contained within the Operating System. For instance, travelers can access Operating System data through the MMTPA comprehensive trip planning service.
			SMH-UN003-v01	User Interface Device						
			SMH-UN006-v01	Real-time information						
			SMH-UN009-v01	USB Charging Ports						

		transit bulletins, and maps.	SMH-UN010-v01	Educational information						
Interactive Kiosk	SMH-DR2329-V01	The Kiosk touchscreen interface content shall include static and real-time traveler information to the extent that each data element is available from the Operating System retrieved through the GTFS real-time data feed. Arrivals in the next hour for that location should be displayed on the screen.	SMH-UN001-v01	Data collection	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	4.1 4.1.1	The IK is a self-service solution that will connect to various data sources that directly or indirectly access data contained within the Operating System. For instance, travelers can access Operating System data through the MMTPA comprehensive trip planning service.
			SMH-UN013-v01	COTA Data	SMH-IX3256-V01	(S) IK-CMS (D) Operating System				
					SMH-IX3258-V01	(S) Operating System (D) IK-CMS				
Wi-Fi Enabled	SMH-DR2400-V01	SMH Wi-Fi enabled technologies shall track number of clients per access point.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	–	–	2.4 4.1.1	The City will leverage its operations agreement to ensure the IK-CMS collects and sends operational and performance data to the Operating System.
Wi-Fi Enabled	SMH-DR2401-V01	SMH Wi-Fi technologies shall log user connection timestamp, IP, MAC, OS, device manufacturer, sites visited, connection status, connection length.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	–	–	2.4 4.1.1 4.1.3	The City will leverage its operations agreement to ensure the IK-CMS collects and sends operational and performance data to the Operating System.

Emergency Call Button	SMH-EN2317-V01	The ECB service shall undergo end-to-end testing by vendor on an annual basis.	SMH-UN007-v01	Emergency Call Button	SMH-IX2433-V01	(S) Emergency Call Button on the Kiosk (D) Emergency Call Center	—	—	2.4 4.1.2	The City will leverage its operations and maintenance agreement with the kiosk vendor to develop recurring testing of kiosk hardware and software services.
			SMH-UN015-v01	Emergency Call Button Integration	SMH-IX2434-V01	(S) Emergency Call Center (D) Kiosk				
Interactive Kiosk	SMH-EN2330-V01	The IK System shall contain the minimum required system components for touchscreen kiosk products, including (a) the kiosk display strategically installed at six SMH locations as outlined in Chapter 2, (b) the kiosk software installed over an existing OS (Latest version of Windows, Linux, or Raspberry Pi) as outlined by the product's system requirements, (c) back-office application server (d) back-office database (e) back-office storage drives and, (f) back-office backup drives.	SMH-UN003-v01	User Interface Device	—	—	—	—	2.4 4.1	The City will leverage its deployment agreement with the kiosk vendor as well as the site agreements with City partners to install kiosks at the six SMH locations. The kiosks are turn-key solutions that have an on-board computer that connects to the IK-CMS system, which is composed of application, content and database servers, storage array and backup media.
Interactive Kiosk	SMH-EN2331-V02	All hardware shall undergo testing procedures and shall include (1) factory	SMH-UN002-v01	Maintenance and Operations	—	—	—	—	2.4	The City will leverage its deployment agreement with the product vendors as well as the site

		acceptance testing, (2) installation testing, and (3) performance testing.									agreements with City partners to install amenity hardware (i.e., kiosk, docking stations, etc.) at the six SMH locations. All hardware and site installation will undergo factory, installation, and performance testing per the agreement.
Interactive Kiosk	SMH-EN2332-V02	The IK System shall be designed with an open architecture intended to facilitate expansion of the functionality and/or scale of the IK System as new data sources, applications, features, standards, and/or technologies emerge in the future.	SMH-UN003-v01	User Interface Device	–	–	–	–	4.1 4.1.1		The IK System is designed for expandability, easily adding more data sources by configuring new feed.
			SMH-UN008-v01	IVR							
			SMH-UN010-v01	Educational Information							
Interactive Kiosk	SMH-EN2333-V01	The IK touchscreen interface design elements and page renderings shall be flexible to enable future enhancements as information and data quantity and quality improves/evolves over time, including modular graphics, design templates controlling color schemes, fonts, backgrounds, etc., and implementation of web	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1 4.1.1		The IK System is a turn-key solution that meets ADA requirements and all of the SMH requirements. The City will leverage its operations and maintenance agreement with the vendor to upload and transform branding specific content and other advertising materials for kiosk rendering. The IK also contains a storage repository for content.

		development best practices, version control, notation, and documentation.								
Wi-Fi Enabled	SMH-EN2402-V01	Wi-Fi enabled technologies should create a wireless network to deliver Wi-Fi coverage zone at each facility. The coverage zone enables mobile users to enter and exit individual access point surface area without loss of connectivity, seamlessly transitioning the signal to another access point within the zone.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	–	–	4.1.3	The wireless subsystem is able to provide denser coverage through the placement and configuration of additional wireless access points (WAP), repeaters and/or other small cell antennas to expand the range of wireless coverage for future scalability of complimentary wi-fi.
Bike-Share	SMH-FN2290-V02	Bike-share docking station shall be installed at SMH locations.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	5.1.2 5.2.2 5.3.2 5.4.2 5.5.2	Geometric layout per facility with bike-share amenity: CSCP, LTC, SSCH, MT-LB, ETC.
			SMH-UN011-v01	Bike Racks						
Bike-Share	SMH-FN2291-V02	The docking station shall accept a secure code generated (through verified payment via MMTA and CPS) for unlocking the bikes.	SMH-UN011-v01	Bike Racks	–	–	–	–	4.1.1.4	The kiosk provides access to MMTA/CPS mobile website through its touchscreen display or Wi-Fi enabled personal device. At the end of the trip planning session, the

										MMTPA provides a booking reservation code which will be used to execute a trip.
Interactive Kiosk	SMH-FN2292-V02	The IK shall allow the user to enter trip feedback such as the operational status of the just docked bike. The operational status could include the need for preventative and repair maintenance.	SMH-UN011-v01	Bike Racks	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.1.3 4.1.1.4	The IK will provide access to the MMTPA. The MMTPA website offers users the ability to enter information through the IK touchscreen display, including trip feedback.
Bike-Share	SMH-FN2293-V01	The docking station shall be solar powered.	SMH-UN011-v01	Bike Racks	–	–	–	–	4.2.2	The docking stations are solar powered.
Bike-Share	SMH-FN2294-V02	The docking station shall report the number of bikes currently docked to the Operating System.	SMH-UN001-v01	Data Collection	–	–	–	–	4.2.5.3	Data collected by the MMTPA will be made available to SMH via the Operating System data utilization component (human interface).
			SMH-UN011-v01	Bike Racks						
Bike-Share	SMH-FN2296-V01	The docking station shall track the date and time when a bike is unlocked.	SMH-UN001-v01	Data Collection	–	–	–	–	4.2.5.3	Data collected by the MMTPA will be made available to SMH via the Operating System data utilization component (human interface).
			SMH-UN011-v01	Bike Racks						
Bike-Share	SMH-FN2297-V01	The docking station shall track the date and time when a bike is locked.	SMH-UN001-v01	Data Collection	–	–	–	–	4.2.5.3	Data collected by the MMTPA will be made available to SMH via the Operating System data utilization component (human interface).
			SMH-UN011-v01	Bike Racks						

Bike-Share	SMH-FN2298-V02	The docking station shall report the operational status of the docking station to the Operating System.	SMH-UN001-v01	Data Collection	–	–	–	–	4.2.5.3	Data collected by the MMTPA will be made available to SMH via the Operating System data utilization component (human interface).
			SMH-UN011-v01	Bike Racks						
Car-Share	SMH-FN2310-V02	The SMH facility shall provide designated parking spaces for car-share vehicles.	SMH-UN005-v01	Facilities	–	–	SMH-CN2424-V01	Constraint 1 Mobility providers must respect existing COTA infrastructure and agreements. Additional registration/agreements with townships are needed.	4.2.2 5.1.2 5.2.2 5.3.2 5.4.2 5.5.2	Proposed service area design per facility, as diagramed in contract plans.
							SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.		
Emergency Call Button	SMH-FN2322-V02	The ECB system shall be capable of two-way voice communications and transmitting GPS location coordinates to the Columbus and Franklin County Emergency Call Centers (ECC).	SMH-UN015-v01	Emergency Call Button Integration	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	4.1.2	The ECB has a bidirectional communication flow via VoIP between the kiosk and the ECC. Location and other safety-related information is sent to the ECC.
					SMH-IX3255-V01	(S) IK-CMS (D) IK				

Emergency Call Button	SMH-FN2323-V02	When an ECB alarm is triggered, the ECB system shall perform the following functions (1) establish a bidirectional voice-enabled communication medium from the IK to the ECC (2) activate the IK camera and record video to local DVR.	SMH-UN007-v01	Emergency Call Button	SMH-IX3254-V01	(S) IK (D) IK-CMS	—	—	4.1.2 4.1.2.3 4.1.2.4 4.1.2.5	The ECB functions like a switch. When pressed, the circuit is completed, establishing a bidirectional communication flow via VoIP between the kiosk as well as activating the audiovisual components of the IK. Video is captured and stored for retrieval by law enforcement upon request.	
			SMH-UN015-v01	Emergency Call Button Integration	SMH-IX3255-V01	(S) IK-CMS (D) IK					
Interactive Kiosk	SMH-FN2335-V02	The IK System shall support multiple languages. At a minimum, English and Spanish shall be supported.	SMH-UN0012-v01	Language Support	—	—	—	—	2.4 4.1	The City provides detailed configuration information to the kiosk vendor to tailor and customize the product fit for purpose.	
Interactive Kiosk	SMH-FN2336-V01	The IK System shall detect and automatically notify the IK System administrator (operating vendor) when a functional abnormality has occurred such as (1) inability to communicate through an interface, (2) inability to send/receive data, (3) service requests and queries extend longer than 10 seconds, (3) invalid or	SMH-UN001-v01	Data Collection	SMH-IX3254-V01	(S) IK (D) IK-CMS	—	—	4.1 4.1.1 4.1.2 4.1.3	IK System detects and automatically notifies the IK System administrator (operating vendor) when a functional abnormality has occurred.	
			SMH-UN002-v01	Maintenance and Operations	SMH-IX3256-V01	(S) IK-CMS (D) Operating System					
			SMH-UN003-v01	User Interface Device							
			SMH-UN004-v01	Public Wi-Fi							
			SMH-UN006-v01	Real-Time Information							

		missing data has been detected.	SMH-UN008-v01	IVR						
			SMH-UN010-v01	Educational Information						
Interactive Kiosk	SMH-FN2337-V02	The IK System software shall be capable of the automatic resolution of system abnormalities, security incidents, faults, and errors (to the extent possible).	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1	The City will leverage its operations and maintenance agreement with the kiosk vendor to establish and measure that the system is operating as agreed. While the kiosk automates various elements, at minimum the agreement will establish notification details for who and what needs to be notified under which conditions.
Interactive Kiosk	SMH-FN2338-V01	All IK communications links shall utilize Transmission Control Protocol/Internet Protocol (TCP/IP) and possess high-speed bandwidth and availability to perform the functionalities described within this SyRS.	SMH-UN003-v01	User Interface Device	–	–	–	–	4.1 4.1.1 4.1.2 4.1.3	IK communications links utilize the standard Transmission Control Protocol/Internet Protocol (TCP/IP) stack and possess high-speed bandwidth and availability.
			SMH-UN004-v01	Public Wi-Fi						
			SMH-UN006-v01	Real-Time Information						
			SMH-UN007-v01	Emergency Call Button						

			SMH-UN008-v01	IVR						
			SMH-UN010-v01	Educational Information						
Interactive Kiosk	SMH-FN2339-V02	All IK System errors, warnings, and self-correcting actions shall be stored locally in ASCII text formatted log files at the IK for a minimum of 24 hours and sent to the OS at regularly scheduled intervals to ensure there are no gaps in log file data.	SMH-UN002-v01	Maintenance and Operations	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	4.1	The IK vendor configures the IK System to capture errors, warnings, and self-correcting actions for local storage to the Operating System at regularly scheduled intervals.
					SMH-IX3256-V01	(S) IK-CMS (D) Operating System				
					SMH-IX3258-V01	(S) Operating System (D) IK-CMS				
Interactive Kiosk	SMH-FN2340-V02	The IK System shall reboot following a power loss or other form of system shutdown.	SMH-UN003-v01	User Interface Device	–	–	–	–	2.4 4.1 4.1.1 4.1.2 4.1.3	The City will leverage its operations and maintenance agreement with the kiosk vendor to establish and measure service level agreements (SLA) unique to each kiosk subsystem (e.g., kiosk display, Wi-Fi, emergency call button, etc.)
			SMH-UN004-v01	Public Wi-Fi						
			SMH-UN006-v01	Real-Time Information						
			SMH-UN007-v01	Emergency Call Button						
			SMH-UN008-v01	IVR						

			SMH-UN010-v01	Educational Information						
Interactive Kiosk	SMH-FN2341-V02	The IK System shall limit the use of internet to the approved applications, services, and features offered through the interactive display, including trip planning and payment via the MMTPA and CPS.	SMH-UN003-v01	User Interface Device	–	–	SMH-CN2426-V01	Constraint 3 The City is evaluating whether advertisement material may be permitted to be posted on infrastructure (kiosks) within right-of-way or on City property.	4.1 4.1.1	The kiosk is configurable and customizable fit to purpose and equipped with event and service monitoring mechanisms that can be configured to notify and take action on a given event based on defined policy rules. For instance, blocking sites, disabling features, etc.
Interactive Kiosk	SMH-FN2342-V01	The IK System shall be designed for unattended operation under normal circumstances, exclusive of manual data entry, public user access, and routine administrative functions.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	4.1	The IK System is configurable for unattended operation per rules engine.
			SMH-UN003-v01	User Interface Device						
Interactive Kiosk	SMH-FN2343-V02	The IK System shall send SMH location, trip mode, and timestamp data to Operating System for all trips generated at the respective IK.	SMH-UN003-v01	User Interface Device	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	2.4 4.1.1	The City will leverage its operations and maintenance agreement with the kiosk vendor to define precisely which data elements need to be captured for performance measurement, at what frequency, etc.
					SMH-IX3256-V01	(S) IK-CMS (D) Operating System				
					SMH-IX3258-V01	(S) Operating System (D) IK-CMS				

Interactive Kiosk	SMH-FN2344-V02	The IK touchscreen content shall be configurable for services offered at each location.	SMH-UN001-v01	Data Collection	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	2.4 4.1 4.1.1.1	The City will leverage its agreement with site owners to establish location-specific content per site.
			SMH-UN003-v01	User Interface Device						
			SMH-UN006-v01	Real-Time Information	SMH-IX3255-V01	(S) IK-CMS (D) IK				
			SMH-UN010-v01	Educational Information						
Interactive Kiosk	SMH-FN2345-V01	The IK touchscreen interface shall prohibit unauthorized users from accessing the Operating System or any GUI, kiosk, or network controls or settings, as outlined in the DMP and DPP.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	4.1.1.3	The kiosk provides user access control and is equipped with a security service monitoring mechanism that can be configured to notify and take action on a given event based on defined policy rules.
Interactive Kiosk	SMH-FN2346-V01	The IK touchscreen interface and its controls shall conform to the applicable accessibility requirements of the Americans with Disabilities Act (ADA).	SMH-UN008-v01	IVR	–	–	–	–	4.1.1.3	The IKE kiosk product is ADA compliant.
Interactive Kiosk	SMH-FN2347-V01	The IK touchscreen interface shall be designed to withstand intentional or unintentional misuse (e.g. repeated tapping	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	4.1.1.3	The IK hardware product is designed for internal and external use and has the ability to withstand intentional or unintentional misuse (e.g. repeated

		of keys) without system malfunction.								tapping of keys) without system malfunction.
Interactive Kiosk	SMH-FN2348-V01	The IK touchscreen interface shall maintain a unique identifier for each kiosk in order to diagnose system malfunctions, provide information to the ECB service, as well as customize content per SMH location (location awareness).	SMH-UN002-v01	Maintenance and Operations			–	–	4.1.1.3	Each field device is IP addressed and uniquely identified.
Interactive Kiosk	SMH-FN2349-V02	The IK touchscreen interface shall not permit access to data deemed to be confidential or inappropriate for public use, as outlined in the DMP and DPP.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1.1.3	The City will leverage its operations and maintenance agreements to ensure kiosks are configured to abide by the City’s DMP and DPP policies.
Interactive Kiosk	SMH-FN2350-V01	The IK touchscreen interface shall utilize a commercial off-the-shelf Kiosk Operating System (KOS) that resides on top of the Operating System (Latest version of Windows, Linux, or Raspberry Pi), in accordance with the software requirements outlined in this SyRS.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1	The IK System is a turn-key solution that will be managed and maintained by the vendor, managed centrally by the IK-CMS.

Interactive Kiosk	SMH-FN2351-V01	Where source data is not available in real-time, the touchscreen shall utilize PDF and/or service board websites in the short term such as transit route maps, location specific services, or tourism information, etc.	SMH-UN003-v01	User Interface Device	-	-	SMH-CN2426-V01	Constraint 3 The City is evaluating whether advertisement material may be permitted to be posted on infrastructure (kiosks) within right-of-way or on City property.	4.1 4.1.1.3 4.1.2 4.1.3	The IK accepts various forms of data formats, including PDF, images, text files, and JSON feeds.
			SMH-UN006-v01	Real-Time Information						
			SMH-UN008-v01	IVR						
			SMH-UN010-v01	Educational Information						
Interactive Kiosk	SMH-FN2352-V02	The IK touchscreen may incorporate a demonstration of the use of the screen, general information, and/or animation while in standby mode.	SMH-UN003-v01	User Interface Device	-	-	-	-	2.4 4.1	The IK is a customizable turn-key solution. The City will leverage its deployment, O&M agreement to define baseline configurations and perform recurring testing to validate those configs.
			SMH-UN013-v01	COTA Data						
Interactive Kiosk	SMH-FN2353-V02	The touchscreen shall display a static or animated screen or series of screens when the kiosk is in standby mode.	SMH-UN003-v01,	User Interface Device	-	-	SMH-CN2426-V01	Constraint 3 The City is evaluating whether advertisement material may be permitted to be posted on infrastructure (kiosks) within right-of-way or on City property.	2.4 4.1	The IK is a customizable turn-key solution. The City will leverage its deployment, O&M agreement to define baseline configurations and perform recurring testing to validate those configs.
			SMH-UN013-v01	COTA Data						
Interactive Kiosk	SMH-FN2354-V01	Users shall exit standby mode by touching the screen or activating any	SMH-UN003-v01	User Interface Device	-	-	-	-	2.4	The IK is a customizable turn-key solution. The City will leverage its

		other kiosk controls. When standby mode is exited, the system shall display an initial start page with links to various sub-menus and content pages that allow the user to reach all information contained within the system.	SMH-UN013-v01	COTA Data						deployment, O&M agreement to define baseline configurations and perform recurring testing to validate those configs.
Ride-Share	SMH-FN2388-V02	Curb space shall be designated for pick-up from rideshare and taxi services.	SMH-UN005-v01	Facilities	–	–	SMH-CN2424-V01	Constraint 1 Mobility providers must respect existing COTA infrastructure and agreements. Additional registration/agreements with townships are needed.	2.4 4.2.1	Service area per facility and agreements for construction and working limits.
			SMH-UN014-v01	Mobility Provider Infrastructure			SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.		
USB Charging	SMH-FN2394-V01	USB charging outlets shall be USB Type A 3.X standard.	SMH-UN009-v01	USB Charging Ports	SMH-IX2437-V02	(S) USB Charging (D) Personal Device	–	–	4.1.4 4.1.4.4	USB charging hubs will be acquired for dual architecture - USB 2.0 (low power) or 3.0 (low power SuperSpeed) type-

										A plug with elongated rectangular cross-section.
USB Charging	SMH-FN2395-V02	The USB charging service shall deliver free charging for travelers to charge mobile devices.	SMH-UN009-v01	USB Charging Ports	SMH-IX2437-V02	(S) USB Charging (D) Personal Device	–	–	4.1.4 4.1.4.5	USB charging hubs will be acquired for dual architecture - USB 2.0 (low power) or 3.0 (low power SuperSpeed) type-A plug with elongated rectangular cross-section.
Wi-Fi Enabled	SMH-FN2403-V02	SMH shall permit electronic devices equipped with internet capabilities (phone, tablet, computer) to connect to the internet via Wi-Fi.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1.3 4.1.3.3	Travelers with a wireless personal device will be able to connect to the IK Wi-Fi network as a guest, after accepting terms and conditions.
							SMH-CN-2430-V01	Constraint 7 The availability of Wi-Fi and accessibility to internet content is determined by operational policy set forth by COTA, who functions as the ISP for users of the Hubs system. The intent of the Wi-Fi service is to provide users access to trip planning applications and information systems. For example, changes		

								to the policies in place that might provide users with access to internet content outside of the intended use, such as social media or video streaming, will greatly reduce available bandwidth of the communications network and may present security concerns as well.		
Wi-Fi Enabled	SMH-FN2405-V01	SMH may consider IEEE 802.11ai to enable Fast Initial Link Set-up (FILS) methods to enhance end-user experience in high-density WLAN environments.	SMH-UN004-v01	Public Wi-Fi	–	–	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1.3 4.1.3.3	The wireless subsystem of the IKE product is able to provide and denser cellular coverage through the placement and configuration of additional wireless access points (WAP), repeaters and/or other multicarrier small cell antennas to expand the range of wireless coverage for future scalability of complimentary wireless along the corridor.
Wi-Fi Enabled	SMH-FN2406-V01	Wi-Fi technologies shall follow IEEE 802.11 b/g/n standards to enable multigigabit throughput in the 2.4	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an	4.1.3 4.1.3.3	Wi-Fi technology follows IEEE 802.11 b/g/n standards.

		GHz, 5GHz and 60GHz spectrum bands.						ISP for their buses and stops).		
Wi-Fi Enabled	SMH-FN2407-V01	An active session with internet access shall be provisioned for the user when that user accepts the terms and conditions of service.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	2.4 4.1.3	The IK vendor shall serve as the ISP for wireless hotspots and shall be responsible for managing internet access when the user accepts the terms and conditions of service.
							SMH-CN-2430-V01	Constraint 7 The availability of Wi-Fi and accessibility to internet content is determined by operational policy set forth by COTA, who functions as the ISP for users of the Hubs system. The intent of the Wi-Fi service is to provide users access to trip planning applications and information systems. For example, changes to the policies in place that might provide users with access to internet content outside of the intended use, such as social		

								media or video streaming, will greatly reduce available bandwidth of the communications network and may present security concerns as well.		
Wi-Fi Enabled	SMH-FN2408-V01	An active session with internet access shall not be provisioned for the user when that user declines the terms and conditions of service.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	2.4 4.1.3	The IK vendor shall serve as the ISP for wireless hotspots and shall be responsible for managing internet access when the user declines the terms and conditions of service.
							SMH-CN-2430-V01	Constraint 7 The availability of Wi-Fi and accessibility to internet content is determined by operational policy set forth by COTA, who functions as the ISP for users of the Hubs system. The intent of the Wi-Fi service is to provide users access to trip planning applications and information systems. For example, changes		

								to the policies in place that might provide users with access to internet content outside of the intended use, such as social media or video streaming, will greatly reduce available bandwidth of the communications network and may present security concerns as well.		
Interactive Kiosk	SMH-FN2441-V01	The IK System shall reset back to the default language at the end of a user session or after a period of two minutes of inactivity.	SMH-UN003-v01	User Interface Device	–	–	–	–	2.4 4.1.1.3	The City will leverage its operations and maintenance agreement with the kiosk vendor to establish the individual kiosk settings as defined through the requirements, including default and supported languages.
Dockless device zone	SMH-FN2442-V01	Designated paved area shall be made available for dockless devices (scooters, e-bikes, etc.) at the SMH facility.	SMH-UN005-v01	Facilities	–	–	–	–	4.2.3 5.1.2 5.2.2 5.3.2 5.4.2 5.5.2	Proposed service area design per facility, as diagramed in contract plans.
Dockless device zone	SMH-FN2443-V01	Boundaries, symbols and/or text description of designated area for dockless devices shall	SMH-UN005-v01	Facilities	–	–	–	–	4.2.3.4 5.1.2 5.2.2 5.3.2	All facilities with proposed service will use thermoplastic pavement markings and flat sheet signage as diagramed.

Appendix A. Traceability Matrix

		be clearly outlined on pavement with paint.							5.4.2 5.5.2	
Interactive Kiosk	SMH-FN2448-V01	Current transit route maps, location specific services, or tourism information, etc., shall be saved on kiosk system so that data is available to be displayed even during periods of communication failure.	–	–	SMH-IX3258-V01	(S) Operating System (D) IK-CMS	–	–	4.1.1.1	Each kiosk contains internal storage for location-specific content management, including transit route maps, location specific services, and tourism information.
					SMH-IX3255-V01	(S) IK-CMS (D) IK				
Interactive Kiosk	SMH-FN2449-V01	IK System files shall be "revolving" or self-appending so that old data is continually overwritten and system data does not reach capacity of available memory.	–	–	–	–	–	–	2.4 4.1	The City will leverage its deployment, O&M agreement to establish kiosk governance for data and retention and will perform inspections to validate those configurations.
Car-Share	SMH-FN3057-V01	Car-share provider utilizing SMH facility shall report the number of available shared vehicles located at each SMH location to the Operating System.	–	–	–	–	–	–	4.2.2.3	Data collected by the MMTPA will be made available to SMH via the Operating System data utilization component (human interface).
Interactive Kiosk	SMH-FN3058-V01	The IK System shall maintain English as its default language setting and provide users the ability to select a language of choice.	–	–	–	–	–	–	2.4 4.1	The IK is a customizable turn-key solution. The City will leverage its deployment, O&M agreement to define baseline configurations and perform recurring

										testing to validate those configs.
Interactive Kiosk	SMH-FN3059-V01	The touchscreen display shall enter “standby mode” after a configurable period of time (default one (1) minute) of inactivity.	–	–	–	–	–	–	2.4 4.1	The IK is a customizable turn-key solution. The City will leverage its deployment, O&M agreement to define baseline configurations and perform recurring testing to validate those configs.
Interactive Kiosk	SMH-FN3061-V01	The IK shall include an integrated security camera and DVR.	–	–	–	–	–	–	4.1.2 4.1.2.3 4.1.2.6	The IK comes equipped with audiovisual hardware (speaker, microphone, video camera). Video will be configured for use only during an emergency call activation. Each kiosk field device also contains an onboard digital video recording device to store 14 days' worth of ECB activation surveillance.
Bike-Share	SMH-FN3070-V01	The docking station shall support a bicycle in a stable upright position.	–	–	–	–	–	–	4.2.5.4.1	Hardware design standards. Minimum standards for bicycles set forth in 16 CFR 1512 and ISO 4210-2:2015.
Bike Racks	SMH-FN3071-V01	The bike racks shall support a bicycle in a stable upright position.	–	–	–	–	–	–	4.2.6.4.1	Hardware design standards for racks. Minimum standards for bicycles set forth in 16 CFR 1512 and ISO 4210-2:2015.

Appendix A. Traceability Matrix

Comprehensive Trip Planning	SMH-IF2315-V01	The CPS application shall be deployed and available for use at the IK display through the MMTPA application.	SMH-UN003-v01	User Interface Device	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.14.1.1.1 4.1.1.3 4.1.3	The kiosk provides access to MMTPA/CPS mobile website through its touchscreen display or Wi-Fi enabled personal device.
					SMH-IX2432-V01	(S) MMTPA (D) IK				
Comprehensive Trip Planning	SMH-IF2316-V01	The MMTPA application shall be deployed and available for use at the IK display.	SMH-UN003-v01	User Interface Device	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.1 4.1.1.1 4.1.1.3 4.1.3	The kiosk provides access to MMTPA/CPS mobile website through its touchscreen display or Wi-Fi enabled personal device.
					SMH-IX2432-V01	(S) MMTPA (D) IK				
Emergency Call Button	SMH-IF2325-V01	An ECB interface shall be designed for public users to alert the Columbus Emergency Call Center officials in an emergency.	SMH-UN007-v01	Emergency Call Button	SMH-IX2437-V01	(S) Emergency Call Button on Kiosk (D) Emergency Call Center	–	–	4.1.2	The ECB is designed for public users to alert Emergency Call Center officials in an emergency situation. Its button is located on the IK field device itself and functions as a switch.
			SMH-UN015-v01	Emergency Call Button Integration						
Interactive Kiosk	SMH-IF2355-V02	The kiosk shall provide a secured, direct-connect interface to facilities for operational administration.	SMH-UN003-v01	User Interface Device	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	4.1	The kiosk shall provide a secured, direct-connect interface to facilities for operational administration.
Interactive Kiosk	SMH-IF2356-V02	The IK System shall provide access to a web or app-based interface with the MMTPA/CPS system to provide comprehensive	SMH-UN003-v01	User Interface Device	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.1 4.1.1 4.1.3	The MMTPA is the source of comprehensive trip planning for mobility. MMTPA can be accessed through the IK or a personal wireless device

		trip planning and trip booking services and disseminate information regarding mobility providers, parking providers, and availability of various modes of transportation to the traveling public.			SMH-IX2432-V01	(S) MMTPA (D) IK				using the IK Wi-Fi network and will be used to disseminate information regarding mobility providers, parking providers, and availability of various modes of transportation to the traveling public.
Interactive Kiosk	SMH-IF2357-V01	The interface to other SMH services offered at the SMH facility (e.g. car, bike, and ride-share) shall be provided through the MMTPA/CPS interface, which provides comprehensive trip planning services for the SMH traveler.	SMH-UN003-v01	User Interface Device	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.1 4.1.1 4.1.3	The MMTPA is the source of comprehensive trip planning services for all amenities offered at SMH facilities. The MMTPA collects and stored data in the Operating System, which is accessed by the user when the user connects to the MMTPA through the IK or personal wireless device.
					SMH-IX2432-V01	(S) MMTPA (D) IK				
Interactive Kiosk	SMH-IF2359-V02	The IK touchscreen shall provide users with a link to display any current alerts that describe events having a significant impact on transportation services.	SMH-UN010-v01	Educational Information	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.1.1	The IK can be configured to display up-to-date event information, including those having an impact on SMH services. Through the operations and maintenance agreement, the IK administrator (IK vendor) is responsible for configuring City-based feeds onto the kiosks.

Appendix A. Traceability Matrix

Interactive Kiosk	SMH-IF2360-V01	The IK touchscreen shall provide users with a link to the COTA real-time display.	SMH-UN006-v01	Real-Time Information	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	2.4 4.1 4.1.1.1	The IK can provide travelers access to the COTA real-time display website by configuring an app that appears as a selectable tile on the screen. Additional agreements with COTA are being developed.
					SMH-IX3257-V01	(S) IK (D) COTA site				
Interactive Kiosk	SMH-IF2361-V02	The IK touchscreen shall provide users with a link to various static maps within the SMH demonstration area.	SMH-UN003-v01	User Interface Device	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.1 4.1.1.1	The IK provides users with access to various static maps (through touchscreen navigation) within the SMH demonstration area. The IK administrator (IK vendor) is responsible for uploading static data provided by the City onto designated IKs.
			SMH-UN006-v01	Real-Time Information						
Interactive Kiosk	SMH-IF2362-V01	The IK touchscreen shall provide users with a link to visitor information, which includes location-aware content.	SMH-UN010-v01	Educational Information	SMH-IX2431-V01	(S) IK (D) MMTPA	–	–	4.1 4.1.1.1	The IK provides users with traveler information services, which includes location-aware content. There are two ways this happens, either access to approved apps (i.e., web services) or static content uploaded and displayed through a content management data feed.
USB Charging	SMH-IF2363-V01	The USB hub should include a minimum of four USB ports for charging mobile	SMH-UN009-v01	USB Charging Ports	SMH-IX2437-V01	(S) USB Charging (D) Personal Device	–	–	2.4 4.1.4	The vendor is responsible for providing a hardware product with a minimum of

		devices to SMH travelers.								four USB ports for charging mobile devices.
Ride-Share	SMH-IF2389-V01	The ride-share service shall be provided through the MMTPA application.	SMH-UN014-v01	Mobility Provider Infrastructure	SMH-IX2432-V01	(S) MMTPA (D) IK	–	–	4.2.1 4.2.1.3	Access to the ride-share service is provided through the MMTPA application.
Wi-Fi Enabled	SMH-IF2409-V01	Wi-Fi services shall be provided through the IK.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	–	–	4.1.3	Wi-Fi services for all SMH locations are provided through the IK.
Interactive Kiosk	SMH-IM2364-V01	The IK System shall perform daily background verification of all external web links and provide immediate notification to the IK System administrator if any link fails verification.	SMH-UN003-v01	User Interface Device	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	2.4 4.1	The IK System vendor is responsible for verification of all content on the kiosk and make corrections as appropriate to resolve broken links. This activity is executed under the operations and maintenance agreement.
			SMH-UN006-v01	Real-Time Information	SMH-IX3255-V01	(S) IK-CMS (D) IK				
			SMH-UN010-v01	Educational Information						
Interactive Kiosk	SMH-IM2365-V01	The IK System backup files (server clone snapshot and data backups) shall be tested quarterly for recoverability integrity.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1	The IK System resides on cloud-based platform as a service to ensure high-availability. It further maintains an onboard staging cache repository for data access when the system is offline. Testing of these components and frequency will be established through the vendor operations and maintenance agreement.
			SMH-UN003-v01	User Interface Device						

Interactive Kiosk	SMH-IM2366-V01	The IK System shall capture and log all data entered through the touchscreen interface for further analysis at the back office for purposes of enhancing location aware services and improving safety at each designated location.	SMH-UN001-v01	Data Collection	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	4.1.1 4.1.1.4	The IK System captures and logs application clicks entered through the touchscreen and sends it to the Operating System for archiving and further analysis for purposes of enhancing location aware services and improving safety at each designated location.
			SMH-UN013-v01	COTA Data	SMH-IX3255-V01	(S) IK-CMS (D) IK				
Interactive Kiosk	SMH-IM3069-V01	All IK software and security systems shall be reviewed quarterly for updates or as updated as new versions become available.	–	–	–	–	–	–	2.4 4.1	The City will leverage its O&M agreement to define baseline configurations and perform recurring testing to validate those configs.
Dockless device zone	SMH-LC2445-V02	Additional space for dockless equipment zone should be made available by stakeholder agency if warranted by increased demand for this service.	–	–	–	–	–	–	4.2.3 4.2.3.2	Devices are typically GPS-enabled with integrated locks. The MMTPA collects data from mobility providers, which will be made available to SMH via the Operating System data utilization component (human interface).
Park & Ride	SMH-LC2455-V01	Additional parking spaces should be made available if warranted	–	–	–	–	–	–	2.4 4.2.4 5.5.2	At this time, park and ride lots are not instrumented. However, the City will

		by increased demand for park and ride services.								leverage stakeholder agreements with site owners to determine if additional spaces are warranted.
Bike Racks	SMH-LC2456-V01	Bike racks should be modular in construction so that additional racks may be installed in the future with similar overall functional and aesthetic qualities.	–	–	–	–	–	–	4.2.6.4.1	Modular design structure of racks to be installed per location and layout for future expansion.
Bike-Share	SMH-LC2457-V01	Docking stations should be modular in construction so that additional racks may be installed in the future with similar overall functional and aesthetic qualities.	–	–	–	–	–	–	4.2.5.4.1	Modular design structure (placement) to be installed per location and layout for future expansion.
Car-Share	SMH-LC2458-V02	Addition of parking spaces should be investigated if warranted by increased demand for Car-Share services.	–	–	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	4.2.2.3	Data archived in the Operating System by MMTPA will be used to ensure operability, service uptime, and trends in transportation for future planning.
Ride-Share	SMH-LC2459-V01	Additional space for pick-up/drop-off zone should be made available if warranted by increased demand for ride-share services.	–	–	–	–	SMH-CN2424-V01	Constraint 1 Mobility providers must respect existing COTA infrastructure and agreements. Additional	4.2.1.3 5.2.1 5.4.1 5.5.1 7	The data collected by the MMTPA, stored in the Operating System will be harvested and analyzed to detect trend patterns and measure performance. City will

								registration/agreements with townships are needed.		leverage stakeholder agreements with site owners to determine if additional space for pick-up/drop-off zones are warranted based on analysis outcomes.
Interactive Kiosk	SMH-LC2460-V02	The IK touchscreen interface shall be designed with flexibility to allow future expansion such as the addition of new software tools, data sources, or other needs that may emerge in the future.	–	–	–	–	–	–	4.1 4.1.1	City of Columbus will be deploying a turn-key product equipped with various mechanisms to easily add new data sources or expand content through applications.
Interactive Kiosk	SMH-MT2367-V01	The IK System shall be designed such that administrative and maintenance activities that require the system to be taken off line can occur at periods of lowest public utilization (e.g. overnight) to maintain maximum system availability for public users.	SMH-UN002-v01	Maintenance and Operations	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	2.4 4.1	City of Columbus will be deploying a turn-key product and will leverage its O&M agreement to establish SLA maintenance timeframes.
					SMH-IX3255-V01	(S) IK-CMS (D) IK				
Interactive Kiosk	SMH-MT2368-V01	The IK and the IK-CMS system shall be maintained by vendor.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1 6	The City will leverage the operations and maintenance agreement with the vendor, who will perform maintenance, replacement, and annual

										functional testing for the IK IK-CMS.
Ride-Share	SMH-MT2391-V01	Each vehicle shall have a unique identifier that is visible to the user.	SMH-UN014-v01	Mobility Provider Infrastructure	–	–	–	–	4.2.1	Each vehicle shall have a unique identifier that is visible to the user.
USB Charging	SMH-MT2397-V02	The IK System contractor shall perform maintenance, replacement, and annual functional testing for all USB charging ports available for public use.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	4.1.4	The City will leverage the operations and maintenance agreement with the vendor, who will perform maintenance, replacement, and annual functional testing for all USB charging ports available for public use.
			SMH-UN009-v01	USB Charging Ports						
Wi-Fi Enabled	SMH-MT2410-V01	IK based Wi-Fi devices shall be managed and maintained by IK vendor.	SMH-UN004-v01	Public Wi-Fi	–	–	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1.3	IK based Wi-Fi devices shall be managed and maintained by IK vendor through the O&M agreement.
Bike Racks	SMH-PR2275-V01	The placement of bike racks shall not impede flow of vehicle or pedestrian traffic.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	4.2.6.4.1 5.3.1	Service area per facility and right-of-way agreements. See contract plans.
			SMH-UN011-v01	Bike Racks						
Bike-Share	SMH-PR2301-V02	The bike-share docking station shall not impede flow of vehicle or pedestrian traffic.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific	4.2.5.4.1 5.1.1 5.2.1 5.3.1 5.4.1 5.5.1	Designated service area per facility and right-of-way agreements.
			SMH-UN011-v01	Bike Racks						

Appendix A. Traceability Matrix

								transit center facility can offer.		
Bike-Share	SMH-PR2302-V02	Bikes that are parked in violation of City codes or are vandalized or inoperable shall be reported to SMH owning agency.	SMH-UN005-v01	Facilities	–	–	–	–	4.2.5.4.1 5.1.1 5.2.1 5.3.1 5.4.1 5.5.1	Service area per facility and right-of-way agreements. See contract plans.
			SMH-UN011-v01	Bike Racks						
Park & Ride	SMH-PR2383-V01	The park and ride facility shall allow parked vehicles to maintain open access to roadway/driveway entrances and exits.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	2.4 4.2.4 5.5.1	The City will leverage stakeholder agreements with site owners to establish amenity design per site.
			SMH-UN014-v01	Mobility Provider Infrastructure						
Park & Ride	SMH-PR2384-V02	The park and ride designated parking spaces shall be located in locations that do not impede the regular flow of travel in the public right-of-way.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	2.4 4.2.4 5.5.1	The City will leverage stakeholder agreements with site owners to establish amenity design per site.
			SMH-UN014-v01	Mobility Provider Infrastructure						
Ride-Share	SMH-PR2392-V02	The City and property owner may designate parking areas or restrict car parking within certain areas.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	2.4 4.2.1 5.2.1 5.4.1 5.5.1	The City will leverage stakeholder agreements with site owners to establish amenity design per site.
			SMH-UN014-v01	Mobility Provider Infrastructure						
Wi-Fi Enabled	SMH-PR2411-V02	Wi-Fi technologies shall support up to 25 number of users	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP	4.1.3 5.1 5.2	The City will leverage the operations and maintenance agreement

		simultaneously connected.						(however, COTA is willing to be an ISP for their buses and stops).	5.3 5.4 5.5 5.6	with the vendor. Currently, the vendor does not impose limitations on number of users, however, the vendor does monitor bandwidth capacity and logs these as events within the Operating System.
Dockless device zone	SMH-PR2450-V02	The dockless parking zone shall not be laid out in a manner which impedes the flow of vehicle or pedestrian traffic.	–	–	–	–	–	–	4.2.3.3.1 5.1.1 5.2.1 5.3.1 5.4.1 5.5.1	Proposed design structure for service area per facility, as diagramed in contract plans.
Interactive Kiosk	SMH-PR2452-V01	IK displays shall meet City outdoor advertisement brightness standards and be capable of adjusting brightness based on varying outside light conditions, according to <u>Columbus Ordinance 3377.08 – Illumination and Special Effects</u> .	–	–	–	–	–	–	4.1 4.1.1.6	The IK brightness is adjustable based on varying lighting conditions as outlined in Table 8: Interactive Kiosk Hardware Components.
Interactive Kiosk	SMH-PR3062-V01	The interface display shall be at least 55" diagonal.	–	–	–	–	–	–	4.1.1 4.1.1.3	The kiosk is equipped with a 65" diagonal display.
Wi-Fi Enabled	SMH-PR3063-V01	The upload and download speed on	–	–	–	–	–	Constraint 5 City does not desire to	2.4 4.1.3	The City will leverage the operations and

		each Wi-Fi access point shall be tracked, monitored, and changed as necessary.						be an ISP (however, COTA is willing to be an ISP for their buses and stops).		maintenance agreement with the vendor. Currently, the vendor does not impose limitations on number of users, however, the vendor does monitor bandwidth capacity and logs these as events within the Operating System.
Wi-Fi Enabled	SMH-PR3064-V01	The load on each Wi-Fi access point shall be monitored and flagged when there is an overloading issue associated with the access point.	–	–	–	–	–	–	2.4 4.1.3	The City will leverage the operations and maintenance agreement with the vendor. Currently, the vendor does not impose limitations on number of users, however, the vendor does monitor bandwidth capacity and logs these as events within the Operating System.
Bike-Share	SMH-PY2306-V01	The bike-share docking station shall have a vertical clearance of at least six (6) feet.	SMH-UN011-v01	Bike Racks	–	–	–	–	4.2.5.4.1 5.1.1 5.2.1 5.3.1 5.4.1 5.5.1	Designated service area per facility and right-of-way agreements. The City will leverage the installation agreement with the kiosk vendor to ensure all construction and installation abide by the codes set forth by the City, defined within this SDD and the contract plans.

Bike-Share	SMH-PY2307-V01	The bike-share docking station shall have an access aisle with a minimum width of five (5) feet.	SMH-UN011-v01	Bike Racks	–	–	–	–	4.2.5.4.1 5.1.1 5.2.1 5.3.1 5.4.1 5.5.1	Designated service area per facility and right-of-way agreements. The City will leverage the installation agreement with the kiosk vendor to ensure all construction and installation abide by the codes set forth by the City, defined within this SDD and the contract plans.
Car-Share	SMH-PY2312-V01	The car-share parking lots shall have a vertical clearance of at least twelve (12) feet.	SMH-UN005-v01	Facilities	–	–	–	–	4.2.2.4.1 4.2.2.4.1	Hardware design governing codes for structures and building per location and layout for future expansion.
			SMH-UN014-v01	Mobility Provider Infrastructure						
Interactive Kiosk	SMH-PY2369-V01	All portions of the IK hardware and communications system shall be locked and secured to minimize the risk of tampering or damage by unauthorized individuals.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1	The City will leverage the operations and maintenance agreement with the kiosk vendor to ensure all construction and installation abide by the codes set forth by the City, defined within this SDD and the contract plans.
Interactive Kiosk	SMH-PY2370-V01	IK equipment shall be oriented and ventilated in a manner consistent with applicable workplace safety, ergonomics, and operated within the	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1 5.1 5.2 5.3 5.4 5.5	Service area per facility and right-of-way agreements. See contract plans.

		environmental parameters recommended by the equipment manufacturers.							5.6	
Interactive Kiosk	SMH-PY2372-V01	The IK System power supply shall be installed in accordance with national and local electrical codes and all central hardware shall be provided with an adequate supply of continuous AC power (i.e., protected from spikes and surges).	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	4.1 5.1 5.2 5.3 5.4 5.5 5.6	The IK System vendor is responsible for providing power and communications to the field devices, which shall be executed through agreements. Where possible, utility power will be used; otherwise, a nearby private owner source can be used.
USB Charging	SMH-PY2398-V01	The USB hardware shall withstand indoor and outdoor environmental conditions such as high and low temperatures, humidity, rain, snow, etc.	SMH-UN009-v01	USB Charging Ports	–	–	–	–	4.1.4	The USB hardware is designed for indoor and outdoor use. The hardware is physically robust to withstand intentional or unintentional impacts normally expected for a commercial grade display accessible to the public.
Wi-Fi Enabled	SMH-PY2412-V01	Wi-Fi equipment shall withstand indoor and outdoor environmental conditions such as high and low temperatures, humidity, rain, snow, etc.	SMH-UN004-v01	Public Wi-Fi	–	–	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1 4.1.1.6	The IK System (and touchscreen interface) is designed for indoor and outdoor use. The hardware is physically robust to withstand intentional or unintentional

										impacts normally expected for a commercial grade display accessible to the public.
Interactive Kiosk	SMH-PY3065-V01	The IK touchscreen interface shall be physically robust to withstand intentional or unintentional impacts normally expected for a commercial grade display accessible to the public.	–	–	–	–	–	–	4.1 4.1.1.6	The IK System is designed for indoor and outdoor use. The hardware is physically robust to withstand intentional or unintentional impacts normally expected for a commercial grade display accessible to the public. See Table 8: Interactive Kiosk Hardware Components for additional information.
Interactive Kiosk	SMH-PY3066-V01	The IK unit shall be a UL certified device.	–	–	–	–	–	–	4.1.1.6	The IK unit is a UL certified device.
Interactive Kiosk	SMH-PY3067-V01	The IK unit shall be capable of withstanding wind loads of vasd = 80 mph and vult = 105 mph for up to three seconds.	–	–	–	–	–	–	4.1.1.6	The IK unit is capable of withstanding wind loads of vasd = 80 mph and vult = 105 mph for up to three seconds.
Bike Racks	SMH-RG2276-V01	The locations of the bike racks shall be	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing	4.2.6.4.1 4.2.5.4.1 5.1.1	Service area per facility and agreements for

Appendix A. Traceability Matrix

		approved by the City or property owner.	SMH-UN011-v01	Bike Racks				infrastructure may limit the features that a specific transit center facility can offer.	5.2.1 5.3.1 5.4.1 5.5.1	construction and working limits.
Bike-Share	SMH-RG2303-V01	The docking stations shall be primarily located within the public right-of-way, along public streets and sidewalks, parks, trails, parking lots/garages, events venues, etc. or be located on private property, provided that the property owner agrees to allow 24/7 public access to the Docking station.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	2.4 4.2.6.4.1	Service area per facility and agreements for construction and working limits.
			SMH-UN011-v01	Bike Racks						
Interactive Kiosk	SMH-RG2373-V01	Installation of IK in the City shall comply with building and construction city codes of Columbus, OH.	SMH-UN002-v01	Maintenance and Operations	–	–	–	–	2.4 4.1 4.1.1.6 4.1.1.7 4.1.1.8 4.1.1.9 4.1.1.10 5.1.1 5.2.1 5.3.1 5.4.1 5.5.1 5.6.1	The City will leverage the installation agreement with the kiosk vendor to ensure all construction and installation abide by the codes set forth by the City, defined within this SDD and the contract plans.
			SMH-UN003-v01	User Interface Device						
			SMH-UN008-v01	IVR						
			SMH-UN010-v01	Educational Information						
Ride-Share	SMH-RG2393-V01	The locations of the ride-share parking lots shall be approved by	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing	2.4 4.2.1 5.2.1	The City will leverage stakeholder agreements with site owners to

		the City and property owner.	SMH-UN014-v01	Mobility Provider Infrastructure				infrastructure may limit the features that a specific transit center facility can offer.	5.4.1 5.5.1	establish amenity design per site.
Wi-Fi Enabled	SMH-RG2413-V02	Usage of all SMH Wi-Fi technologies shall be regulated by property owner.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Kiosk Wi-Fi (D) Personal Wireless Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1.3 4.1.3.3	IKE comes with built-in Wi-Fi technologies that requires users to accept terms of use. In addition, the kiosk is equipped with an event and service monitoring mechanism by which the Wi-Fi is regulated.
Wi-Fi Enabled	SMH-RG2414-V01	Users may be redirected to a landing page designated by vendor or property owner when connecting to Wi-Fi technologies once the user accepts the terms and conditions of service.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1.3 4.1.3.3	IKE comes with built-in Wi-Fi technologies that requires users to accept terms of use.
Wi-Fi Enabled	SMH-RG2415-V01	Wi-Fi technologies shall present the user with a landing page designated by vendor or property owner to display the free Wi-Fi terms and conditions of service and prompt the user to accept.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1.3 4.1.3.3	IKE comes with built-in Wi-Fi technologies that requires users to accept terms of use for free use.

Appendix A. Traceability Matrix

Ride-Share	SMH-RG2444-V01	The locations of the ride-share parking lots shall be approved by the City or property owner.	SMH-UN005-v01	Facilities	–	–	SMH-CN2427-V01	Constraint 4 Physical right-of-way and existing infrastructure may limit the features that a specific transit center facility can offer.	2.4 4.2.1 5.2 5.4 5.5	The City will leverage stakeholder agreements with site owners to establish amenity design per site.
			SMH-UN014-v01	Mobility Provider Infrastructure						
Dockless device zone	SMH-RG2447-V01	The locations of the dockless device zones shall be approved by the City and property owner.			–	–	–	–	5.1.2 5.2.2 5.3.2 5.4.2 5.5.2	Proposed design structure for service area per facility, as diagramed in contract plans and City agreements with facility owners.
Bike-Share	SMH-RG2461-V02	The locations of the docking stations shall be approved by the City and property owner.	–	–	–	–	–	–	4.2.5.3.1 5.1.2 5.2.2 5.3.2 5.4.2 5.5.2	Designated service area per facility and right-of-way agreements.
Bike-Share	SMH-SR2308-V01	The docking station shall permit the locking of the bicycle frame and one (1) wheel to the rack.	SMH-UN011-v01	Bike Racks	–	–	–	–	4.2.5	Stations are fully automated and provide a locking mechanism that allows travelers to check bicycles easily in or out of designated stations.
Interactive Kiosk	SMH-SR2376-V01	The IK System components shall be protected by firewalls and equipped with security detection, prevention, and response mechanisms to guard against intentional and	SMH-UN003-v01	User Interface Device	–	–	–	–	4.1 4.1.1	The kiosk is protected through user access controls and is equipped with an event and service monitoring mechanism that can be configured to notify and take action on a given event based on defined policy rules.

		unintentional threats to the integrity of the system arising from unauthorized access, computer viruses and worms, system abnormalities or faults, and other sources of potential harm.								
Interactive Kiosk	SMH-SR2377-V01	The IK System shall accommodate multiple tiers of user data security to allow distinct privileges to access data based on user roles (e.g. public user, administrator, service accounts, City and COTA personnel, data miner, external agency, etc.)	SMH-UN001-v01	Data Collection	-	-	-	-	4.1 4.1.1	The IK-CMS manages user access to the system and field devices via defined security policies.
			SMH-UN002-v01	Maintenance and Operations						
			SMH-UN003-v01	User Interface Device						
Interactive Kiosk	SMH-SR2378-V01	The IK System shall be designed to preserve the privacy of individual public users of the system and provide data protection, such as encrypting login credentials, payment information, and other sensitive data captured through the kiosk and transmitted over Wi-Fi or fiber.	SMH-UN003-v01	User Interface Device	-	-	-	-	2.4	Through vendor agreements, the kiosk vendor will be subject to compliance with the City DMP and DPP policies and governance.

Interactive Kiosk	SMH-SR2379-V01	The IK System shall detect and automatically alert the IK System administrator when a security incident has been detected such as (1) kiosk access door has been opened, (2) cybersecurity alert has been logged by the unified threat management software (anti-virus, malware detection, etc.), (3) misuse of kiosk features such as recreational web browsing through the interactive display or attempts to intercept communications between interfaces.	SMH-UN002-v01	Maintenance and Operations	SMH-IX3254-V01	(S) IK (D) IK-CMS	–	–	4.1	The kiosk is equipped with an event and service monitoring mechanism that can be configured to notify and take action on a given event based on defined policy rules.
					SMH-IX3255-V01	(S) IK-CMS (D) IK				
Interactive Kiosk	SMH-SR2380-V01	The integrity of IK System applications, communications, and network links shall be secured through mechanisms such as password authentication.	SMH-UN003-v01	User Interface Device	–	–	–	–	4.1 4.1.1 4.1.3	The kiosk is protected through the event and service monitoring mechanism that can be configured to notify and take action on a given event based on defined security policy rules.
Wi-Fi Enabled	SMH-SR2416-V01	A timer shall be implemented to track the length of time a Wi-Fi connection has been active.	SMH-UN004-v01	Public Wi-Fi	–	–	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an	4.1 4.1.3	The kiosk is equipped with an event and service monitoring mechanism that can be configured to notify and take action on a

								ISP for their buses and stops).		given event based on defined policy rules.
Wi-Fi Enabled	SMH-SR2419-V01	Usage shall be tracked on all Wi-Fi technologies, per device, in order to validate proper usage of public wireless as per COTA internet usage policy.	SMH-UN004-v01	Public Wi-Fi	–	–	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1 4.1.3 4.1.3.3	The kiosk is equipped with an event and service monitoring mechanism that can be configured to notify and take action on a given event based on defined policy rules.
Wi-Fi Enabled	SMH-SR2421-V01	Wi-Fi technologies shall terminate a connection if any of the following conditions have been met (1) a violation of Wi-Fi technology usage has been identified (2) connection has extended beyond two hours.	SMH-UN004-v01	Public Wi-Fi	SMH-IX2435-V01	(S) Wi-Fi on Kiosk (D) Personal Device	SMH-CN-2428-V01	Constraint 5 City does not desire to be an ISP (however, COTA is willing to be an ISP for their buses and stops).	4.1 4.1.3 4.1.3.3	The kiosk is equipped with an event and service monitoring mechanism that can be configured to notify and take action on a given event based on defined policy rules.
Interactive Kiosk	SMH-SR2453-V02	All IK software and security systems shall be reviewed by IK administrator quarterly for updates or as updated as new versions become available.	–	–	–	–	–	–	2.4	The City will leverage its operations and maintenance agreement with the kiosk vendor to define and perform recurring maintenance of all hardware and software elements.

Source: City of Columbus

Appendix B. Acronyms and Definitions

Table 19 contains project-specific acronyms used throughout this document.

Table 19: Acronyms List

Acronym/Abbreviation	Definition
AC	Alternating Current
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
AED	Automated External Defibrillator
AEP	American Electric Power
AV	Automated Vehicle
BO	Branch Office
BRT	Bus Rapid Transit
CEAV	Connected Electric and Automated Vehicles
CMAX	COTA's Bus Rapid Transit Branding
CML	Columbus Metropolitan Library
ConOps	Concept of Operations
COTA	Central Ohio Transit Authority
CPS	Common Payment System
CSCC	Columbus State Community College
CTP	Comprehensive Trip Planning
(D)	Interface Destination (Traceability Matrix tables)
DC	Direct Current
DCP	Dedicated Charging Port
DMP	Data Management Plan
DPP	Data Protection Plan
ECB	Emergency Call Button
ECC	Emergency Call Center
ETC	Easton Transit Center
EV	Electric Vehicle
EVC	Electric Vehicle Charging
EVCS	Electric Vehicle Charging Station
FMLM	First-Mile/Last-Mile

FPS	Frames per Second
GUI	Graphical User Interface
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secured
IBC	International Building Code
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
IK	Interactive Kiosk
IK-CMS	Interactive Kiosk Central Management System
IKE	Orange Barrel Media's Kiosk Branding
IPS	In-Plane Switching
IPSec	Internet Protocol Security
IPv#	Internet Protocol version number (e.g., IPv4, IPv6)
ISO	International Standards Organization
ISP	Internet Service Provider
IT	Information Technology
IVR	Interactive Voice Response
JSON	JavaScript Object Notation
LCD	Liquid Crystal Display
LTC	Linden Transit Center
MaaS	Mobility as a Service
MAC	Media Access Control
ML-LB	Metropolitan Library – Linden Branch
MMPA	Multimodal Trip Planning Application
NLPR	Northern Lights Park and Ride
O&M	Operations and Maintenance
OUI	Open Usability Interface
P3	Public-Private Partnerships
PAR	Pedestrian Accessible Route
PCI	Payment Card Industry
PD	Personal Device
PII	Personally Identifiable Information
PKI	Public Key Infrastructure
QoS	Quality of Service

RFID	Radio-Frequency Identifier
ROW	Right-of-way
(S)	Interface Source (Traceability Matrix)
SAE	Society of Automotive Engineers
SASP	System Architecture and Standards Plan
SC	Smart Columbus
SDD	System Design Document
SEMP	System Engineering Management Plan
SLA	Service Level Agreement
SSCH	St. Stephen's Community House
SSD	Stopping Sight Distance
SMH	Smart Mobility Hubs
SSL	Secure Sockets Layer
SyRS	System Requirements Specification
TCP	Transmission Control Protocol
TLS	Transport Layer Security
UI	User Interface
UL	Underwriters Laboratories
UPS	Universal Power Supply
URL	Uniform Resource Locator
USB	Universal Serial Bus
USDOT	United States Department of Transportation
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network
WAN	Wide Area Network
WAW	Wide Area Wireless
WCAG	Web Content Accessibility Guidelines
WWW	World Wide Web

Source: City of Columbus

Appendix C. Glossary

Table 20 provides definitions for project specific terms used throughout this document.

Table 20: Glossary

Term	Definition
App	Software application.
Aggregate data	Data that has been combined in collective or summary form.
Application Programming Interface (API)	The specific method specified by an operating system or program through which a programmer can make requests to the operating system of another application. An API can be differentiated with a graphical user interface (GUI) or a command interface, which are direct user interfaces to an operating system or a program.
Archive	A collection of data that has been packaged together for backup, for transfer to some other location, for saving away from the computer making hard disk storage available. An archive can include a simple list of files or files organized under a directory or catalog structure, depending upon how a particular program supports archiving.
Authorization request	A request initiated by a user to access a data or part of a system for which he or she does not have access privileges. The criteria used to evaluate this request is called the “authorization rule.”
Bulk data transfers	A computer-based procedure designed to move large data files. The procedure usually involves data compression, blocking, or buffering to maximize data transfer rates.
Travelers (end users)	The travelers (residents and visitors) in Columbus who will be interacting with the SMH system to view, plan, reserve, and navigate to desired parking.
Commercial-off-the-shelf system (COTS)	Software or hardware product that are ready-made and available for sale to the public.
Communications protocol	A set of conventions that governs the communications between systems, applications, processes, or objects. These conventions specify the format and content of messages to be exchanged and allow different computers using different software to communicate.
Data exchange format (DXF)	A proprietary but published two-dimensional graphics file format supported by virtually all PC-based computer-aided design (CAD) products. It is now a de facto standard for exchanging graphics data.

Source: City of Columbus



THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR